SEXTANT

$2.95
July-August 1985
Issue No. 17

The Independent Magazine for Users of Heath/Zenith Microcomputers

ZDS Introduces Five New Computers

Moving Up to MS-DOS 2

Add Automatic Key Repeat to Your '89 or '19

Build Your Z100 a Real-Time Clock

A Public Domain Enhancement for CP/M's Command Processor

An Exercise in Z100 Assembly Language

SEXTANT

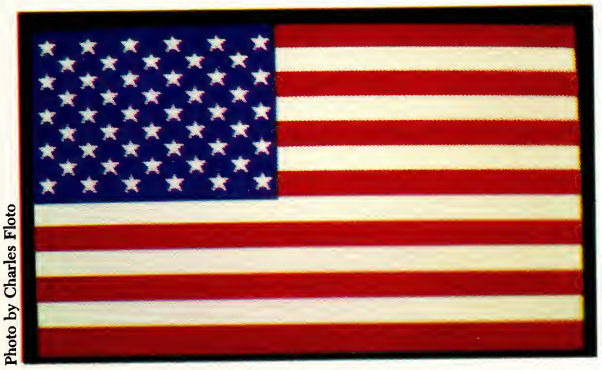

Photo by Charles Floto

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You know the Z100 is capable of high-resolution color graphics. But you know the pitfalls, too. So many graphics programs are expensive. Or they don't support color. Or they require too much memory. Or they're hard to use. If they don't have these limitations, they're probably not very reliable. Well, there's an exception—Doodler comes out on top on all counts.

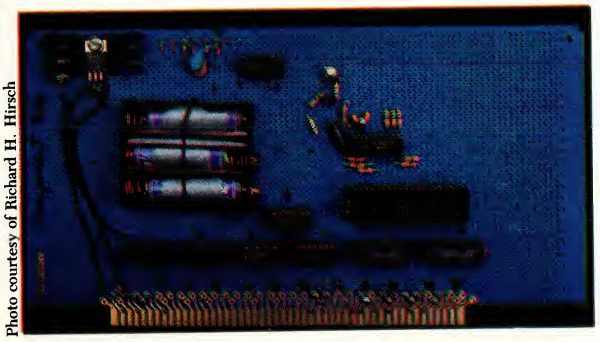

Photo courtesy of Richard H. Hirsch

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It gets tedious: checking the calendar, typing in the date, checking the clock, typing in the time, every time you boot up the Z100. If you use MS-DOS 2, at least it remembers what they were the last time you turned off the computer. Even then, though, the *time* won't be right. And the date might not be, either. Well, consulting a clock is just as easy for the computer as it is for you—once you build the board.

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Affordable Graphics for the Z100 7
Marilyn Harper

ZDS Introduces Five New Computers 12
Times have changed since the days when Zenith took years to come out with one computer. Although we're sure their computers are still better than the rest, they're not nearly so distinctive as they used to be. Zenith introduced five new ones at COMDEX in May. Four of them are extensions of the Z150 line, including a portable and a laptop model. The fifth is an 80286-based model compatible with IBM's PC AT. All five incorporate advances over IBM's models.

The Benchmark Word Processor 15
Donald Carter
Some of you may remember Autoscribe, a word processor for the H8 and H/Z89 that was known for its ease of learning and ease of use. From that tradition comes Benchmark, available now in both CP/M and MS-DOS versions. It has menus, but not too many. It has one-key commands. And it's flexible and easy to use.

Build Your Z100 a Real-Time Clock 20
Richard H. Hirsch

ZCPR—A Public Domain Enhancement for CP/M's Command Processor 29
Mitchell S. Ross
We've said it here before. CP/M's user interface hasn't won it any awards lately. It could use some help. In this case, help is just a phone call away—on many bulletin boards, as well through the mail from some clubs and at least one vendor. ZCPR installs in place of CP/M's command processor. It improves some of CP/M's commands, and adds more of its own. And costs next to nothing.

Add Automatic Key Repeat to Your '89 or '19 54
Ray Albrektson
If you've used a Z100, an IBM PC, or even just an electric typewriter, the key repeat on the H/Z19 and '89 seems like a step backwards—a whole separate key to hold down, besides the one you're trying to repeat. It turns out to be surprisingly easy to add an automatic key repeat circuit to these machines. It takes only a few dollars and a few hours.

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Moving Up to MS-DOS 2 64
Wayne Rash, Jr.
If you use Z-DOS, and haven't moved up to MS-DOS 2, you may be wondering what all the fuss is about. And after all the time ZDS took to release their version, you may be saying, "It better be good." It is. It nudges the Z100 a little closer to IBM compatibility. It has I/O redirection, hierarchical directories, device drivers, pipes, and a host of new commands and utilities. And from what we've heard of earlier releases of MS-DOS 2, we're glad Zenith took the time to do some debugging.

The Intelliburner: Software-Controlled PROM Programming 74
Thomas R. Fox

A Versatile Printer Driver for CP/M 85
Daniel N. Jerome
It's not really a "true" device driver. But it does the job. It lets you set margins, tabs, print style, and more, from your H8 or '89. It lets you set the handshaking protocol—including some options not provided by Heath. And you can include an ASCII string to set those features not built into the program. All this for each of eight printer units—up to eight different printers, or the same printer eight ways. And it can be used as a spooler, so after you tell it just which way you want it to print, you're back at work.

OFFLIN: An Exercise in Z100 Assembly Language 89
William S. Hall
Computers designed with an independent terminal—such as the H/Z89—usually also have an OFFLINE key. When the computer is off line, any character typed at the keyboard is sent directly to the screen. With the Z100, though, the terminal is an integral part of the computer. There's no key to take you off line. OFFLIN will do this job; it will take any character typed at the keyboard and repeat it back to the screen, as if it came from a program.

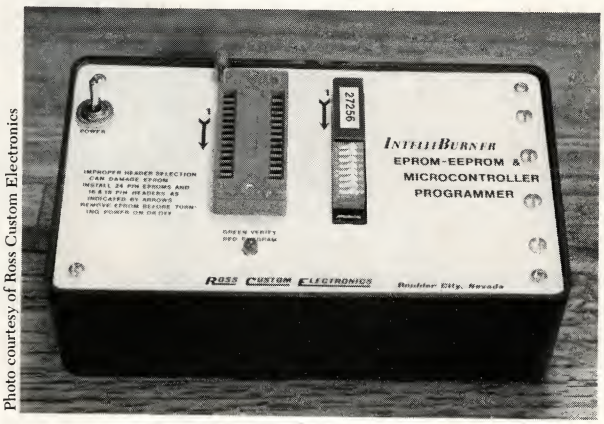

Photo courtesy of Ross Custom Electronics

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In the past, PROM programmers have not been an attractive alternative for hackers, small-time entrepreneurs, or anyone else who didn't have hundreds of dollars to spend on one that might program only a few chips. With the Intelliburner, Ross Custom Electronics has not just slashed the price to within reach of common folk. They've also got a versatile machine that works through your H/Z89 or '100 to program many different EPROMs, EEPROMS, and microcontrollers.

The Editorial Eye

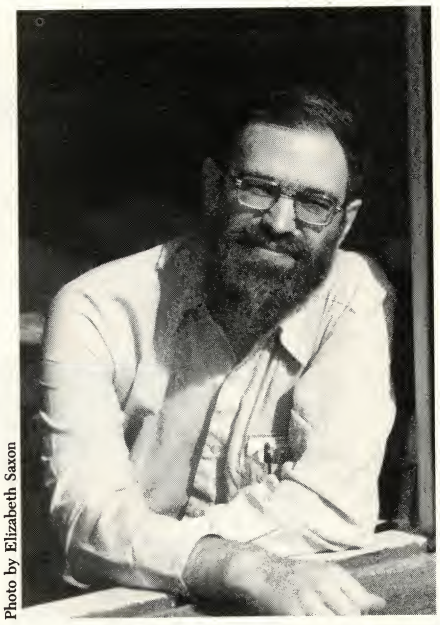
Photo by Elizabeth Saxon

Zenith Data Systems has finally decided to live up to advertising that their computers go beyond IBM compatibility to deliver "total performance." ZDS has introduced four new computers that run 30% to 70% faster than comparable products from IBM. (See page 12 for details.)

I've been waiting for this for a year and a half. In the fall of 1983 I predicted: "ZDS *could* maintain an advantage over IBM among buyers willing to look beyond a computer's name plate, but it will never do so by imitating the limitations of two-year-old products." (*Buss: The Independent Newsletter of Heath Co. Computers*, November 16, 1983.)

I have no reason to think Zenith finally saw the wisdom of my advice. There must be some other reason ZDS decided to make the Z200 30% faster than IBM's PC AT. Perhaps they've been keeping their ears open in the marketplace. Or maybe IBM should get the credit. Some of the limitations of the IBM PC AT are so embarassing that no other company in the world could get away with them. Would you believe piggybacked memory chips which operate too slowly to keep up with the rest of the computer?

Whatever the success of Zenith's new computers may be, the outlook for *Sextant* seems pretty good right now. This issue, for example, is the biggest one we've published. A lot of the credit goes to Bryan Rutberg's efforts to bring you more advertising.

We have a new tool to help us tune the magazine to your interests. We recently received a report from McGraw-Hill Research on their second survey of *Sextant* subscribers. It suggests that almost two-thirds of our readers are still interested in the H8 and H/Z89-90 eight-bit computers. About half are interested in the Z100 dual processor machines. Slightly fewer are interested in IBM-compatible products, such as the Z150. (Yes, I know that adds up to 160%—our subscribers aren't all satisfied with owning just one computer.)

I was also interested in the answer to the question: "Which of the following *best* describes your involvement with Heath/Zenith computers?" A fifth of those surveyed picked "Hobby only." An eighth answered "Professional/business only." Fully three-fifths responded "Hobby and professional/business."

I'd like to thank the 79.5% of those we surveyed who returned a questionnaire. In scientific terms, this means there's only a 5% probability that the results are off by more than 3.36 percentage points.

I like to balance statistically valid quantitative facts with personal communication. I'm looking forward to chatting with *Sextant* readers during the International Heath/Zenith Users' Group Conference August 9-11. (See "Scuttlebutt" for more on HUGCON.) My public remarks will provide "A Look Back at Our First Eight Years." I hope you can make it to Chicago to meet some of our staff.

Charles Floto

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Sextant (ISSN 0731-2180) is published bimonthly by Sextant Publishing Co., 716 E Street, S.E., Washington, DC 20003. Second-class postage paid at Washington, DC and at additional mailing offices. POSTMASTER: Send address changes to Sextant, 716 E Street, S.E., Washington, DC 20003.

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Subscription rates: 6 issues (1 year) in U.S.—$14.97; in Canada and Mexico—$17.25; overseas—$21.00. Payment accepted by check in U.S. dollars payable on a U.S. bank, by U.S. and international postal money order, and by Visa and MasterCard. Please allow six to eight weeks for delivery.

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Letters

Opposite conclusions

I read Rick Lutowski's critique of the 8088 in the May-June issue with considerable interest, since he based his discussion on FORTRAN programs, and I do a lot of programming in that language. The facts he develops are interesting, and I agree with most of *them*. However, I draw from them almost exactly the opposite *conclusions* about the utility of the 8088.

Very few FORTRAN programs of interest to me will run with less than 64K bytes of data (which will hold 8,000 REAL*8 numbers); many also require more than 64K bytes of code. Thus it doesn't matter at all to me whether Z80 FORTRAN is more efficient for the small-memory model, since my programs can't use that model. Of course, overlays of both code and data from disk can allow bigger programs to run in small memories, but this is slow and painful (as users of PDP-11s will know). This same sort of memory requirement seems to hold for modern business programs like 1-2-3, since they are all memory hogs, but I have little first-hand experience with them.

Lutowski extols the National Semiconductor microprocessors, and indeed they may be very fine, but I can't use them without software. No one will invest in the development of complex programs like FORTRAN compilers until there is a pool of tens of thousands of potential customers. There are five good FORTRANs for the 8086 family (and at least ten C's), but where is the first one for the 16032? No, Zenith isn't going to bring out a machine with an NS chip in it very soon; as you note in the gossip column of that same issue, the next thing out of St. Joseph will be an AT clone with an 80286 in it. (By the way, why does Lutowski not even mention the other members of the 8086 family?)

The article displays some misunderstanding about real mathematics in Microsoft's FORTRAN-86. The default library for a machine without an 8087 truly *emulates* what goes on in the 8087. This means that it does all its calculations in an 80-bit floating-point format, truncating the results as called for by the storage format of the main program. This seems quite inefficient and a curious default choice, but that's the way it was done. The most recent version of this compiler (version 3.2, also sold by Heath/Zenith as MS-5063-2) contains an alternate mathematics library, ALTMATH, which computes in limited precision at higher speed on machines without an 8087. But anyone doing serious work in FORTRAN needs an 8087. (However, Lutowski admits he doesn't have one, forcing him to do his 8087 benchmarks on an IBM PC.)

The best MS-DOS FORTRAN I have found is by Ryan-McFarland, also sold as IBM Professional FORTRAN. It is about 20 to 30% faster than MS-FORTRAN version 3.2, and it runs just fine on a Z100 with an 8087 (which is required, as noted in the article). It is a full implementation of ANSI FORTRAN-77, whereas the Microsoft compiler omits some valuable features such as string functions. There is an extensive discussion of its design and how it copes with the peculiar addressing modes of the 8088 in an article in the *IBM Systems Journal*, Vol. 24, No. 1, 1985. Other articles in this issue, which is devoted to IBM's recent hardware and software upgrades for the PC, will be of interest to *Sextant*'s technically oriented readers.

Lest I be taken as an unqualified admirer of the Intel microprocessors, I should say I am puzzled that the paragraph size was chosen as only 16 bytes, since this limits the maximum address space to only a megabyte. If 256-byte paragraphs had been chosen, so that the segment registers were displaced from the offset registers by eight (instead of four) bits, a total address space of 16 megabytes would have been available. The 80286 achieves this end in a different way, so that it remains code-compatible with the earlier chips—of course.

Anyway, I'm pretty happy to have a computer with a tenth the power of a VAX sitting in my home, and another in my office, and to have the kind of software support that allows me to run the same programs on the Z100 and on a VAX (when I need that extra power). If someone wants to wait for the "perfect microcomputer," he's quite welcome.

Alan T. Moffet
Los Angeles, CA

Z100 Tidbits

Received the May-June issue of *Sextant* today, and I found the "Z100 Notebook" by Alison Phillips very interesting. The portion titled "COPY CON YELLOW.BAT" provided me with the clue I had been looking for: how to enter an ESC code into a file from the keyboard. Use the F8 key.

The column goes on to suggest using a batch file to send commands to the terminal. This uses 2K of disk space for each file. A better way is to send terminal commands directly to the terminal from the COPY command. The format is COPY CON CON <RETURN>. Then enter the terminal command(s) you wish to send, using the F8 key to enter an ESC character. End the sequence with a CTRL-Z and *presto!* the command is done. This is simple, free, and takes no disk space.

Another tidbit is the double prompt sometimes seen after a batch file is executed. This is caused by an extra carriage return's being included in the batch file. When using COPY CON XXXX.BAT to write batch files, put the CTRL-Z at the end of the last line of text. Then press RETURN to end the file. When using WordStar to write batch files, don't end the last line of the file with a carriage return, and no more double prompt.

If you use the file CONFIG.SYS only to enter BREAK ON, delete the CONFIG.SYS file and include the BREAK ON command in your AUTOEXEC.BAT file. This saves 2K of disk space.

MS-DOS 2.20 is being delivered by Zenith. So is WordStar 3.31.

John W. Freed
Oak Harbor, WA

Illustrator on the Z100

I am writing with regard to the article "Great Graphics on the '19 and '89" by Morton and Scott in the May-June 1985 issue.

On page 25 it is stated that there is a version of the Illustrator available for the Z100 that requires no additional hardware.

Originally I believed this, too, but having been burned to the tune of $90 I'd like to prevent this from happening to someone else.

Illustrator works *only* on those Z100s having 192K of main memory. Very little of it will run with 128K.

Nowhere in the packaging or documentation is this fact mentioned; you have to discover it the hard way. I learned of it only when I called the author to find out why his program(s) wouldn't run on my machine.

You will do potential buyers a service by warning them of this trap.

Ross Whistler
Dover, MA

Command error code checking

First there was the type-ahead buffer, followed by SUBMIT, DOCOM, and now Shell Tandem. (See "Put HDOS Commands on Disk," *Sextant* #14, and "Another Approach to Command Processing Under HDOS," *Sextant* #15.) All these are good batch tools in an on-line environment. Each of these enhanced the functionality of the previous.

Now we need command error-code

checking. If a mount fails... if a copy fails... do you want to continue the batch process? For me? No!

A long look at .ERROR indicates that there is no provision for saving the error code in RAM. However, a short patch to HDOSOVL0.SYS can take care of that.

The function of the patch is to create a new field in HOSEQU.ACM called S.ERRCD, and to save the error code. This field is located one byte below the stack at 041.145A. [See Listing A for the patch.]

In the shell tandem modules, SH.ABS clears the error-code field. SH.DVD interrogates the field and if it is not zero, aborts the rest of the shell file.

In SH.ABS, in paragraph "EXIT" add:

```
MVI     A,0
STA     S.ERRCD
```

In SH.DVD, in paragraph "SWITCH", after JZ RETURN add:

```
LDA     S.ERRCD
ORA     A
JNZ     ABORT
```

The command "DATE" will also zero the error-code field.

Define S.ERRCD in HOSEQU.ACM as:

```
S.ERRCD EQU 041145A LAST ERROR CODE ISSUED BY .ERROR
```

HDOS 2.0 is great!

Robert Pearce
Mesa, AZ

A couple of small corrections

Having purchased a Z100 and received several back issues of *Sextant* just last week, I hope you will excuse the tardiness of this letter. The probability formula, $p = 2L/(\pi H)$, given in "Pi a la Mode on the Z100" (*Sextant* #11, July-August 1984), is correct only for $L \leq H$. When $L > H$ the formula is $p = (1 - \sin\beta)*2L/(\pi H) + 2\beta/\pi$, where $\beta = \arccos(H/L)$. Here L = length of the needle, H = distance between the parallel lines, and β is measured in radians. It may also be interesting to note that although the program is entertaining, it is useless as a means for estimating π since an accurate value of π is required to generate random angles properly. (Note the program statement 150 LET p = 3.14159)

On a different topic, a small correction is needed in the article "Graphic Algorithm Optimized for 8080 or Z80" (*Sextant* #10, May-June 1984). On page 66 the statement R := XORD(R) should instead read IR := ROUND(R*255.0/(XMAX–XMIN)), since IR is a scaled length, not a scaled coordinate.

James Tursa
Austin, TX

Toolworks C/80

We at The Software Toolworks read with interest the letter from William Tavolga (*Sextant* #15, March-April 1985, page 5) regarding the $49 Small-C Compiler for Z-DOS available from Clarkson University, particularly since he also mentioned our Toolworks C/80 compiler for CP/M and HDOS.

Many of your readers (we hope!) will be pleased to hear that Toolworks C/80 for MS-DOS is now available. And the price is still only $49.95. Unlike the Small-C compiler Mr. Tavolga mentioned, Toolworks C *does* support arrays, structures, unions, and nearly every other feature of C as described in *The C Programming Language*, by Kernighan and Ritchie. We don't supply the source for the compiler itself, though.

In addition, the MS-DOS version of Toolworks C/80 supports a complete standard C library, execution profiling, and low-level access to MS-DOS and hardware. Source for all the library and runtime routines is included. I/O redirection and the exec( ) function are supported under both MS-DOS version 1 (Z-DOS) and version 2. The compiler generates .OBJ files directly (avoiding the slowness of MASM noted by Mr. Tavolga), and a command-line switch permits generation of .ASM files, compatible with MASM. As if this weren't enough, it runs the "Sieve of Eratosthenes" benchmark in 12 seconds, nearly as fast as compilers costing ten times as much.

As with our CP/M and HDOS compilers, Toolworks C/80 for MS-DOS is sold as an integer-only compiler. The 'long,' 'float,' and 'double' data types can be added by purchasing the optional Toolworks C MATHPAK for $29.95 (in preparation).

Michael E. Duffy
The Software Toolworks
15233 Ventura Boulevard, Suite 1118
Sherman Oaks, CA 91403
808/986-4885

```
PATCH   HDOSOVL0.SYS/DISP:12

000002  305/307         CHANGE MODULE LENGTH

004110  117/315         CALL ERROR CODE PATCH
        006/321
        000/011

011321  000/062         SAVE THE ERROR CODE AT S.ERRCD
        000/145
        000/041

        000/117         REPLACE THE EXISTING CODE
        000/006
        000/000
        000/315         RETURN

013303  000/111         ADD THE CALL ADDRESS TO THE RTL
        000/004
        000/000
        xxx/000         CREATE A NEW RTL TERMINATOR
        xxx/000

        xxx = I forgot to write down these letter values
```

Listing A.

Help with PeachText 5000

In response to the plea for help from Mr. Christensen ["Letters," March-April 1985] for silencing the key click when using PeachText 5000 on the Z100, we offer the following advice based on the instructions given in *Sextant* by Gary Scheidegger ("Letters," September-October 1984):

1. Edit the help file PTHELP.DAT within PeachText 5000.
2. Insert the following lines at the top of the file:

```
\DISK ON, PRINT OFF
\TM0, BM0, LM0, RM99
\OUT 27, 120, 50
\BF, SSA, SSB, BY, UN, CMD
```

Note that you must use zero, not the letter "O", for the margin parameters in the second line above.

3. End the Edit session (thus saving the file).
4. Print the PTHELP.DAT document (this will create a PTHELP.PRN file).
5. Delete the original PTHELP.DAT file.
6. Rename PTHELP.PRN PTHELP.DAT.
7. To silence the key click, run PT, then hit ? to invoke the HELP file, and the key click will vanish.

Although this method works well, it is somewhat complicated, and the resulting PTHELP.DAT file is about 14,000 bytes long vs. 8,000 bytes for the unmodified PTHELP.DAT file. A better way to silence the key click is to use the DEBUG utility to patch PeachText 5000. The procedure is as follows:

1. Copy DEBUG.EXE onto the disk containing PTMENU.PGM.
2. Type DEBUG PTMENU.PGM ‹RETURN›
3. Search PTMENU.PGM for the text "MSA" by typing

```
S 0 L FFFF "MSA" ‹RETURN›
```

DEBUG will return a value such as

0A4B:19FF, which is the starting address of the text "MSA". "MSA" is part of the text header "an MSA company", which is displayed when PeachText is invoked.

4. Type E0A4B:19FF ‹RETURN› (or whatever value was returned in 3, above).

5. Enter IB ‹SPACE› 78 ‹SPACE› 32 ‹RETURN›. You should see:

0A4B:19FF 4D.1B 53.78 41.32

6. Type W ‹RETURN› to write the patched PTMENU.PGM back to the disk.

7. Type Q ‹RETURN› to quit DEBUG.

Now, when you run PeachText, instead of the text "MSA" being displayed, the key click will be suppressed.

Note that you can replace more text than just "MSA" if you like without harming program operation. Also, additional commands can be added to change more than just the key click; for example, we have entered the following to change the screen colors to white letters on a blue background:

1B ‹SPACE› 6D ‹SPACE› 37 ‹SPACE› 31 ‹RETURN›

This is the sequence "ESC m71". This and other ESCape codes are documented in Appendix O of the Z-DOS manual. If "an MSA company" is completely replaced, up to 14 characters can be inserted.

Janet and Richard Hirsch
Webster Groves, MO

Programs for the Imaginator

I enjoyed your article on the Cleveland Codonics board in your May-June issue.

I use my H89 and the Codonics board almost daily with my own programs as well as from within dBASE II. (It gives the H89 an effective graphics capability similar to Lotus 1-2-3.)

The software described in the article sounds like fun; however, since most of the Codonics users probably create their graphics from within their own programs (the majority of which are written in MBASIC), most users probably don't need the complex programs which allow for creation of random boxes, diamonds, circles, etc. These users most likely only need a simple and effective method of dumping the graphics to a printer, saving it to a file, or temporarily storing several screens of graphics in memory. Something simple, effective, and very inexpensive.

I wrote such programs before I was even aware that more complex and costly programs were commercially available.

My programs are CP/M executable .COM files, originally written in assembly language, hence are very compact (1 or 2K) and quite fast. I've decided to make them available, very inexpensively, to H89 Codonics users.

The first program dumps the graphics screen to an Epson printer equipped with Graftrax almost as fast as the Epson can print. This is about 30 times as fast as an MBASIC program can do it. It also dumps the full-width screen, all 504 pixels, not just 480 as some commercial programs do.

The second program saves the full graphics screen to your disk. The file is written in binary, hence it is about 1/10 the size of a comparable file written in MBASIC. It too is about 30 times as fast as an MBASIC program. These files can be read back from disk to re-paint the graphics screen at will.

The third program is unique, and has proven to be invaluable to me. It enables the user to store up to three complete graphics screens in separate 'pages' of memory. This gives the user the ability to create, store, and overlay graphics on the screen much as transparencies can be overlayed by an overhead projector. This resulting combination of graphic overlays can then be saved to your disk and/or dumped to the printer as well.

I also compiled a character generator program which provides the user with the capacity to create alphanumeric characters on the graphic screen. The user provides simple x-y coordinates and the 'string' to be displayed, enabling him to label, number, or include text within the graphics display.

Although I originally wrote these programs for my own use, I believe simple, effective, and inexpensive software should be available to everyone. I will include these programs, a demo, and documentation on an SS/SD HS disk for $19 to all *Sextant* readers who contact me. Except for the public domain, you can't get much more inexpensive than that.

Steve Leache
10 Cullinan Drive
Gaithersburg, MD 20878

The price you pay for speed

Just read Wayne Rash Jr.'s article, "Speed Up Your '100 50%," involving C.D.R.'s ZS100 (*Sextant* #16, May-June 1985). I don't know what is included with the ZS100, but I do know that if you do speed up you'd better use the 8088-2 8-MHz CPU instead of the 8088 that is shipped with the Z100. Although the 5-MHz 8088 will operate at higher clock rates, there is no guarantee that they will continue to do so.

All commercial ICs are usually specked over a temperature range of 0 to 70 degrees C. Operating outside these limits can spell trouble. The 8088 may operate fine with the Z100's cover off, but button it up and let cook a while, and all hell can break loose. Also, with age the actual operating characteristics of the IC will vary, and with time operation may become faulty and unreliable.

I haven't found where I can get the 8-MHz 8088 for $30, but I can get the 5-MHz 8088 for $20. The last time I looked, the 8088-2 was running around $90. So for $50 what do you get from C.D.R.? A lot of grief?

If you are using the 8087 math processor and plan to up the clock to 8 MHz, get the 8-MHz 8087-2 for around $280, versus $160 for the 8087. That's the price you pay for speed.

I don't use an 8087 in my H/Z100 and have upgraded to the 8088-2. Presently I am running at 7.3728 MHz and haven't experienced any problems for over two months. I plan to speed up the 8-bit 8085 by 20% by replacing the 5-MHz chip with a 6-MHz version.

David S. Podejko
Norwalk, CT

HDOS Marquee

Re: the article "MBASIC Marquee" on page 69 of issue #14:

Mr. Dotson states that if the program is to be used in HDOS, then the INKEY$ function and associated coding need to be removed. I would like to suggest that it runs correctly in HDOS on my H89 if INKEY$ is replaced with CHR$(INP(232)). Alternately, INKEY$ and following may be replaced with

A=INP(232): IF A=32 THEN....

I've been wanting for some time to make a suggestion—you asked quite some time back for any suggestions that might improve your magazine. I'd like to see you put some kind of a mark to indicate the end of an article. Sometimes you can't tell the end for sure from the text and go looking for the next page. Some magazines use a small square, *TV Guide* uses a small TV screen with END in it, one I know of puts the author's name and credentials, etc. Maybe you could use a small version of your logo or even just the lightning under it. Or something!

Sincere thanks for a good magazine.

Bill White
Miami, FL

Thanks for the suggestion. △

Corrections

In issue #16, some information was left out of the article "Add an Automatic Brightness Control to Your '89." For Q1, the author used a Radio Shack 276–130 NPN silicon phototransistor. The potentiometer (R1) has a value of 50 kilohms.

In the same issue, we incorrectly stated that Illustrator is available from WIzard Software House for CP/M ("Great Graphics on the '19 and '89). It is not available for CP/M. Also, WIzard Software House can be reached at a second phone number, in addition to the number published in *Sextant*. The new number is 617/881-2543.

In "Supplier Notes" in the May-June 1985 issue, the pricing for additional graphics pads for use with DEMOGRAF may not have been clear. The pads are $4.95 per pad of 50, plus $1 for shipping and handling.

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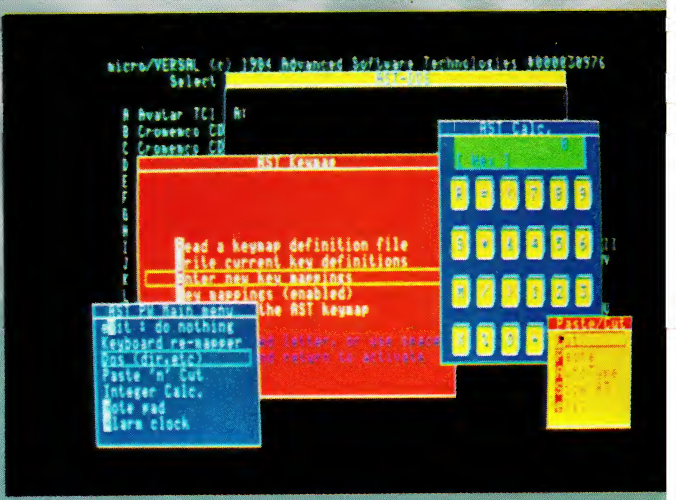

Shown are Genie windows as they appear on the Z-100. From the left: The Genie main menu, the Genie keyboard macro generator the Genie DOS, Calculator, and Cut and Paste menu. In the back is our micro/VERSAL disk to disk file transfer program, running as a regular application.

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Affordable Graphics for the Z100

Doodler is easy to use, and has many features usually found only on more expensive programs.

Marilyn Harper

Photo by Charles Floto

Doodler is a graphics-design utility which runs under the Zenith Disk Operating System (Z-DOS). It supports a number of popular dot-matrix printers and all the memory and terminal configurations of the Z100 family.

With Doodler, graphic designs are created on the screen. They can be dumped to the printer, and they may be saved to disk (in two quite different forms, as we will see). Doodler is not a plotting package; it does not convert data into charts for graphics display.

I found Doodler easy to learn and easy to use. The owner's manual is concise, well written, and suitable for users at any level of experience.

The programs are in compiled Z-BASIC and assembler, and they are quite robust. Some of the graphics utilities I have used on the IBM Personal Computer have cost more and yet been nowhere near as bullet-proof as Doodler.

The Doodler distribution disk contains two versions of the main program. Which one you use depends on the amount of memory your system has. One version requires at least 192 kilobytes of random-access memory (RAM). The other version, which is called DOODLERS ("S" for "small") will run on Z100s which have only 128K of RAM.

All of the Zenith video monitors are supported, ranging from ordinary monochrome to color display and including intensity-level monochrome (which substitutes eight intensity levels for color).

Because I have access to a variety of Z100s, I was able to compare Doodler's performance on all of the different hardware models which are supported. I ran DOODLERS on a 128K machine with monochrome display and only one bank of screen memory. I ran the larger version Doodler on machines which had up to 512K of main memory. And I was able to run Doodler with an intensity-level monochrome display with three banks of screen memory, as well as with a color monitor.

Doodler is supplied with a demonstration file which puts the program through its paces. The graphics demo was not very interesting on a plain monochrome screen. It counts on using eight colors; but plain monochrome gives it only normal video, reverse video, and half-intensity to work with.

Aside from missing a flashy screen appearance, however, I judged Doodler to be just as useful to monochrome owners as to color owners. This is particularly true if the main application is to produce printed graphics.

In addition to the large and small versions of Doodler, the package provides two other programs.

One of these is an Install utility. This lets you select a brand of printer; it is also important in going between your color monitor and your black-and-white printer. A pixel, or dot, on the screen is made up of three points—red, green, and blue. So one pixel can actually be illuminated three times at once. The mixture of light from these three points produces the color of the pixel as a whole. A printer, of course, cannot mix colors that way. Install, therefore, lets you determine which colors of the three basic ones will be printed by a dump from the color monitor to the printer.

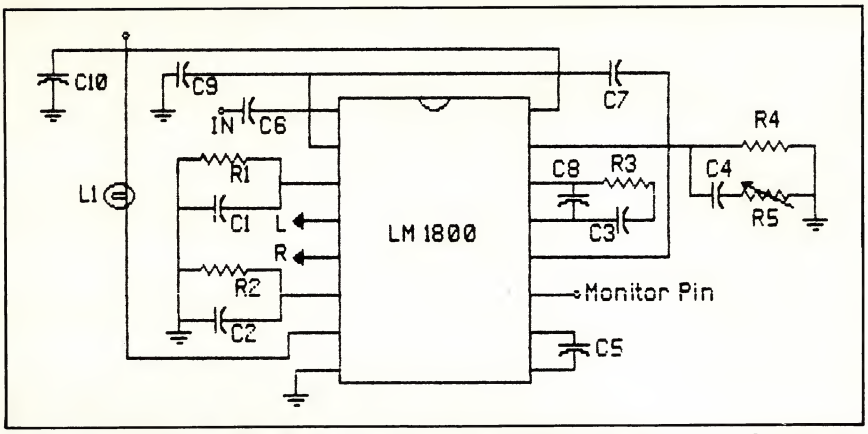
The printers supported under version 3.02 include models from Star, Epson, M.P.I., Okidata, and C. Itoh. (Other printers are likely to be included by the time you read this.)

The final program in the Doodler package is a character-design utility, which is called Create.

The main functions

Four main functions can be performed with Doodler. These are drawing on the screen, saving your screen design to disk, printing from the screen, and recalling a drawing or sequence of drawings to the screen. All these functions work well and are easy to learn. The only limitation is that the size of a design cannot be larger than the screen.

Doodler provides a full-screen drawing editor; nonetheless, the user must declare a rectangular area called a "frame" around a design before it can be saved or printed. The maximum size of a frame depends on how much main



Pictures created under Doodler can be printed by hitting a function key. (The printout shown here has been reduced slightly.)

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memory your system has.

If you have 192K or more of RAM, a frame can include the entire screen (216 x 640 pixels, or dots). But a frame is limited to about 2/3 of the screen (150 x 640 pixels) on the 128K machine.

This limitation is not a problem when the goal is to produce graphics hardcopy. Successive frames can be dumped to the printer in sequence to fill as much of the page of paper as you wish.

Using Doodler to draw

Doodler gives the user a blank screen; the cursor is a flashing pixel. There are 14 commands, displayed on the 25th line (also called the status line); they are invoked with the top-row function keys. A label strip provided with the package fits above these keys and makes it easier to associate the commands with the appropriate keys.

The most basic command is a toggle between MOVE and DRAW modes. MOVE mode is used when you want to reposition the cursor without having any effect on the screen. In DRAW mode, moving the cursor turns on each pixel that is crossed.

The COLOR command lets you select the screen color in which the drawing commands will be executed. If you want to erase an area of the screen, you change the current drawing color to be the same as the background color; then draw over the pixels which you want to turn off.

Moving the pixel-sized graphics cursor is almost intuitive. It uses the same keys which would control a text-oriented task: the cursor arrows, TAB, RETURN, and HOME. All of these keys will auto-repeat if held down; or you may speed them up by use of the FAST REPEAT key.

Doodler also has a STEP function. STEP n (where n equals 1 to 9) lets you select the number of pixels the cursor will be moved with each keystroke.

The current location of the cursor is constantly updated in the status line. This location is given in terms of its x and y pixel coordinates.

Four of Doodler's commands are geometric drawing functions. These are LINE, BOX, CIRCLE, and OVAL. To use these commands, you simply position the cursor to mark the appropriate boundaries of the shape; the program calculates which pixels need to be turned on to achieve it.

There is also a fast area-fill command called PAINT. And if you want to create irregular or intricate shapes, simply toggle to DRAW mode, set the STEP value to the desired resolution, and move the cursor around.

Text in a Doodler design is also handled in the form of bit-mapped graphics. You can select not only a particular character font, but also the

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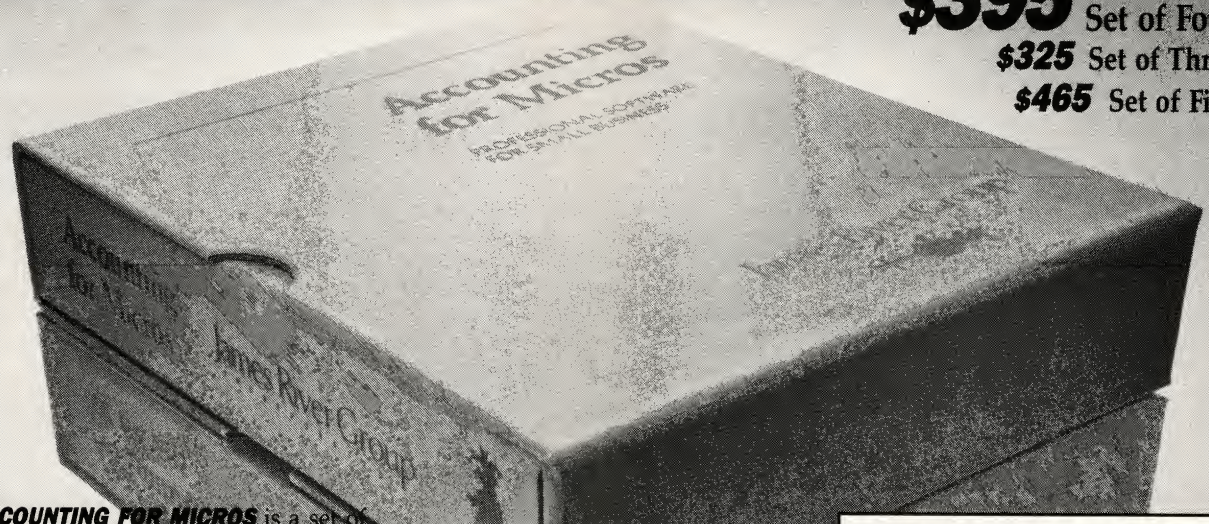

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July '84, pp 120-121

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April '83, p 234

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Dec. '83, p 22

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color, size, and slant in which the characters will be displayed.

Text is entered into a drawing simply by pressing the alphanumeric keys. Four font files are provided on the distribution disk; you may also design your own character set with the Create utility.

Doodler screen frames

Doodler uses the concept of a frame (or window) to allow the manipulation of a design as a single object. A frame is a rectangular area defined by the user. This is done simply by moving the cursor to the desired points and marking them by hitting the appropriate function key. Thereafter, the frame is indicated on the screen as a dashed-line box.

The contents of a frame can be moved or copied to a new position, saved to disk, or sent to the printer. The functions to move and copy a frame offer a number of interesting options, such as turning the destination design upside down or creating a mirror image.

Doodler frame designs can be saved to disk as bit-mapped "picture" files. The FILES command allows the retrieval and display of pictures saved to disk. Frame pictures may vary from entire screens to small sub-elements. An example of the latter might be your company logo, which could be retrieved from disk and placed into any design you create.

Note that saving an entire screen to a picture file requires you to have a 192K machine, so that you can define a frame that large. Owners of 128K models can still save and retrieve a complete screen, but they must do it in at least two pieces.

To print a Doodler design, you first mark a frame around the part of the screen to be printed. As with saving a screen, printing the entire screen at one time requires 192K of RAM; but this limitation can be worked around by printing successive frames.

On hitting the function key to print a frame, you will be prompted for horizontal and vertical spacing; and you can choose an optional offset from the left margin of the paper.

The spacing parameters allow you to set the relationship between the width and the height of the printed image—its aspect ratio. The aspect ratios used by printers and by computer screens are generally very different. If you do not compensate for it, this difference can result in distortion of the printed version. Doodler allows you to experiment with these factors and choose an aspect ratio in which your printed image looks best.

Doodler character fonts

The Doodler Create utility is a standalone program which lets you design and edit an alternate character font file. You can thereafter select your font file from within Doodler to be used as the current character set. Then any alphanumeric key you press will result in the display of whatever new character you designed for that key. Create offers you a design matrix for each character, in which you indicate which pixels are to be turned on.

The full printable ASCII character set (characters 32 through 127) is available in each font; however, you have full freedom to assign the shape of your choice to each character code. This means you don't have to stick to the usual upper- and lowercase letters plus numerals and punctuation marks.

You could design a set of electrical symbols, a foreign-language alphabet, or musical-score notations. You could even use Create to re-map the standard characters so you could experiment with an alternate keyboard design layout, such as a Dvorak keyboard.

Using the Doodler playback feature

Doodler offers a sophisticated feature called the screen playback. A playback is a keystroke buffer stored as a disk file. Playback files may be created at any time by the user, because Doodler is busily storing all of your commands in memory while you draw.

When a playback file is read in from disk, the stored keystrokes are executed just as though the commands were coming from the keyboard. These replayed keystrokes drive the display to recreate the original design on the screen. Doodler's demo is such a playback file.

The chief advantage of the playback function is that it lets you easily create screen displays which can be run automatically, thus giving the effect of animation.

Another advantage of the playback is its significant economy in disk storage space, compared to the binary picture file. There are 138,240 pixels in a monochrome screen, requiring about 17K to store as a binary image. The number of keystrokes involved in creating a screen design is likely to be considerably less.

Conclusions

I was impressed by Doodler. It contains many sophisticated features for a graphics utility in its price range. The package is well documented and easy to use.

Screen-oriented applications can be enhanced by the use of the playback function. Hardcopy-oriented applications can make good use of Doodler's control over the aspect ratio. All users are likely to appreciate the ability to create new customized character sets.

Ordering Information

Doodler, version 3.02 (Z-DOS), $79.95.
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ZDS Introduces Five New Computers

Three new IBM-PC compatibles, a PC AT compatible, and a laptop more than double Zenith's product line.

Zenith unveiled five new computers at COMDEX this spring. All five models are scheduled for summer delivery. For more information, write Zenith Data Systems, 1000 Milwaukee Avenue, Glenview, IL 60025; or call 800/842-9000, ext. 1.

Photo courtesy of Zenith Data Systems

The new Z158 computer looks the same as the year-old Z150—from the front. Examination of the back reveals a new switch. It's used to boost operating speed from the standard 4.77 MHz up to a blazing 8 MHz. A ZDS engineer told *Sextant* this makes the Z158 only about 10% slower than the Z200 with its 80286 operating at 6 MHz.

With a single floppy disk drive, the Z158 lists at $2,499. Add $400 for a second floppy or $1,600 for a 10 megabyte hard disk. Cost to upgrade a Z150 to Z158 performance had not been announced when this issue went to the printer.

Photo courtesy of Zenith Data Systems

You can pick up a Z171 for $2,699. That includes two ⅓-height floppy disk drives, 256K of RAM, a parallel printer port, and a serial port. Two versions of MS-DOS are furnished in order to maximize compatibility with software written for the IBM Personal Computer. The unit weighs under 15 pounds.

You can make it a bit heavier by adding a 12 volt battery pack and expanding the memory to 640K. An optional video board supports an external color or monochrome monitor.

The Z171's own liquid crystal display is backlighted for optimum visibility in any ambient illumination. Brightness and contrast controls are provided. The screen can display not only twenty-five 80-column lines of text, but also graphics in shades of gray.

Photo courtesy of Zenith Data Systems

Three new monochrome monitors fight the problem of reflections of other light sources. Their flat screens have a non-glare surface. The ZVM 1230 with green screen and the amber-screen ZVM 1220 each list at $199. The $229 ZVM 1240 is designed for use with a high-resolution monochrome video display card. All three embody what ZDS calls "a sleek, modern accent look."

The Z200 Advanced PC is Zenith's response to the IBM PC AT. It copies the latter's 80286 central processor, but supports it with faster memory chips than are currently used by IBM. The result is a speed advantage put in the 30% range.

The Z200's disk controller can handle as many as two floppy drives and three hard disks. Both of the computer's basic configurations include 512K of RAM and a 5¼" floppy disk drive with capacity of 1.2 megabytes. Also standard are a serial and parallel port, a clock/calendar, 64K of ROM firmware, a 200 watt power supply, and the MS-DOS 3 operating system. Addition of a 20-megabyte hard disk boosts the Z200's suggested price from $3,999 up to $5,599. Either model accepts an optional 360K floppy drive.

Prices do not take into account the cost of a video display card; the buyer has a number of options including color and high-resolution monochrome boards. Installing one in the Z200 leaves six expansion slots available.

Photo courtesy of Zenith Data Systems

The Z148 is a lower-budget version of the Z158—$600 to $700 lower. The only thing it lacks is the backplane for optional circuit cards, although a single slot may be added at extra cost.

Photo courtesy of Zenith Data Systems

The Z138 is a transportable version of the Z148. The extra $400 cost buys a 7" amber display. Weighing in at 24 pounds, the dual-drive configuration is put at $2,599. A single-drive Z138 lists for $2,299.

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The Benchmark Word Processor

Benchmark—son of Autoscribe—is versatile and easy to use.

Donald Carter

Most of us have heard of some lucky person's coming across a "sleeper"—colloquially, something with a value which has not yet been recognized. That describes my surprise when I first saw the Benchmark word processor in operation. Not one of the computer magazines which reach my hands had ever carried a description of this program. How had so many periodicals failed to describe this unusual product?

Right from the introduction of tabletop microcomputers, text editing has been a very rewarding application. These programs form an admirable extension of the creative mind, enabling thought processes to attain a rapid transition from ideas to words. And they do it all without the constraints of pen or typewriter.

Word processors were available, of course, long before the days when our eyes were treated to the dynamic splendour of computerized arcade games. But they were not available to the home user. As the price of disk drives became acceptable, the cost of dedicated word processors moved down to almost $5,000.

Then, in 1978, Michael Shrayer's Electric Pencil created its unusual form of magic; word processing had come to microcomputing. As the competition moved in, writers began to describe the capabilities of different programs; even the least adventurous computer owner could make a choice.

Selecting a word processor

However, the era of the first word processor programs soon disappeared. More sophisticated developments such as WordStar and Magic Wand were offered. The Heath Users' Group's publication, *REMark*, joined other magazines in offering a platform for lawyers and professional writers to debate their preferences (with an intensity generally reserved for political arguments).

If readers had studied every article in the leading magazines, they must have been faced with a dilemma; the only conclusion was that each new word processor program was better than any other. Obviously, this is not the logic needed to make a selection.

A more involved study would indicate that the advocates of each program in reality had selected the one which best matched their particular needs. Perhaps the problem of choosing a word processor can be compared to a search for one's lifetime mate—selection is influenced by many complex factors. They include undefinables such as preference and taste, as well as emotions. No matter how successful the inevitable marriage, onlookers sometimes wonder at the display of complete satisfaction.

In a similar way, word processors now have so many complexities that choosing one is almost as complex as selecting a spouse. But with one main difference—no period of courtship is offered!

Benchmark proved to have many of the delights of Autoscribe without any of its faults.

It is in this category of achievement that Benchmark assumes its greatest importance. It forms an ideal which all computerists should seek—articulate, clever, amazingly agile and flexible.

Onward to Autoscribe

My H89 was used to improve the efficiency of my marine construction and repair business. (See my article, "How to Save Kilobucks with a Business Microcomputer," in *Sextant* #3, Fall 1982.) It was so reliable and such an old friend that I couldn't bear to part with it when it came time to dissolve the firm (an event precipitated by losing an argument with a faulty aluminum stepladder). In the long months which followed, I overcame boredom by using Zenith's Autoscribe to write articles, even a lengthy novel.

In 1980, Autoscribe was introduced as Zenith Electronic Typing; running under the Heath Disk Operating System (HDOS), it cost $395. It was valuable in business writing, very unobtrusive, and easy for the uninitiated to learn.

However, it had a few annoying habits—such as refusing to type just one page from a document. As well, it had an avid interest in "finishing" a manuscript before its time. (If you weren't alert, you could get into Control Mode instead of Insert. Then if your next word began with with upper- or lowercase "F", Autoscribe would immediately store the document to disk.)

These faults seemed to be correctable by patch or update; so I started a search for Soft Words, Inc., and the Phoenix Group, whose names were in the user manual. But I found no one at Heath or Zenith who could provide a lead. At one point, Grant Gustafson at Viking Software came to my rescue and gave me an eight-line patch to convert the F for Finish to CTRL-F. The comradeship of these busy computer people is continually amazing.

... and some searching for names

When the search appeared almost hopeless, a faint recollection led to an article by Larry Press in *onComputing* (Summer 1980, "Word Processors—A Look at Four Popular Programs"). It included a description of Autoscribe and provided the first clue to finding its authors: that Autoscribe had been distributed by Micro Source in Arizona. They in turn were able to tell me that they had acted as distributors for Metasoft Corporation of Casa Grande, Arizona.

The cheerful ladies at *that* address were amused by my story and eager to bring me up to date. Just as the company had changed names, so had the product. Autoscribe had been replaced by Benchmark in 1980.

(Reflecting the confidence they have in their product, the name "Benchmark" has almost replaced "Metasoft." They are still the Metasoft Corporation, but they do most business as Benchmark Software.)

And Benchmark was growing. Version 2 for the '89 had required the CP/M operating system and 48 kilobytes of

random-access memory (RAM). It had pretty much been phased out by Version 3, though, requiring 64K.

At that revelation, I thought I was out of luck. My faithful '89 had only 48K. But, they told me, some of the original releases might still be available from H & H Computer Enterprises of Blacksburg, Virginia. This was good news since Jim and Cherie Hassall had been most patient and helpful in matching my '89 to the incredible C. Itoh 8510A printer. (I use the H & H 8255 parallel input/output board. Jim described the theory behind it in "A Parallel Interface for the '89," in *Sextant* #1, Spring 1982.)

Help from H & H

Jim seemed surprised with the news that Autoscribe had been developed by the people he identified with Benchmark. Then to our mutual delight, he recalled the many similarities. Yes, Benchmark was easy to use; and it had immense flexibility. And one last issue of Version 2 was in stock to match my 48K '89.

Support software was available from Lindley Systems of Bedford, Massachusetts. So I could interface my H & H I/O board with the C. Itoh or virtually any other printer. The only problem in sight was that Heath had discontinued the ORG 0 kit required for older '89s to run standard CP/M; but Heath's hardware department cheerfully provided a list of parts and instruction sheets.

Good luck kept coming: Heath had just announced their great Christmas sale—which included CP/M. With the usual unwarranted fear and trepidation and quite a few hours of study (in which the authors of articles in *REMark* were blessed), I had CP/M up and running.

I only wish I had had the current version of the Lindley support software. Installing it takes only about 30 seconds. With the earlier version, I had to reassemble the Heath/Zenith version of CP/M's basic input/output system (BIOS) to fit my configuration (parallel I/O replacing serial). The precise instructions from Lindley Systems required several hours of keyboard thumping; but ultimately, it led to a matching BIOS and other mysterious catechisms.

Benchmark

Benchmark proved to have many of the delights of Autoscribe without any of its faults. Moreover, there doesn't appear to be any end to its capabilities; it has virtually all the flexibility of other word processors, plus many unique features.

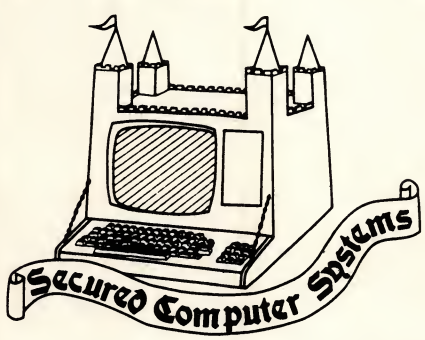
Among word processors, Benchmark occupies a happy medium between extremes.

Many of us find "menu-driven" word processors easy to learn. There are menus to take you by the hand to accomplish whatever you want. But after a while, you notice they are holding your hand in an iron grip. You have to read through endless menus one after another to do even the simplest jobs. The program knows best.

A "command-driven" word processor, on the other hand, is much faster and more flexible—once you learn its language. Then you simply tell it what to do in a few well chosen characters. But learning the language is a job in itself. Remembering the syntax is taxing. And for some of the more powerful command-driven packages, the mere list of commands can go on for a solid page or more. You are very much on your own. Do not expect the program to tell you what to do. *You* tell *it*.

Benchmark's philosophy falls somewhere in the middle. Menus can be kept to a minimum because the program is largely "function-key-driven." You press a function key (to search for a word, say) and it will ask you for the appropriate input. (The delete key is used to tell Benchmark to execute any operations selected.)

Have you ever gone into a computer store to help an acquaintance select a computer? Then tried to demonstrate a strange word processor? Have you found it difficult to find the key which



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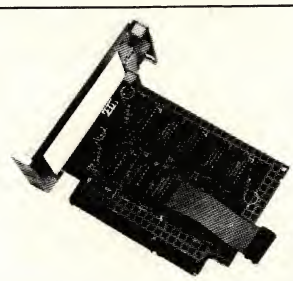

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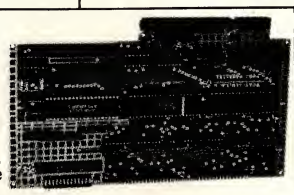

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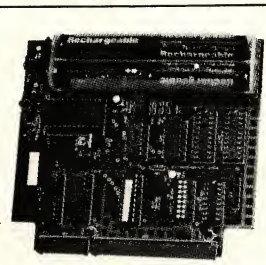

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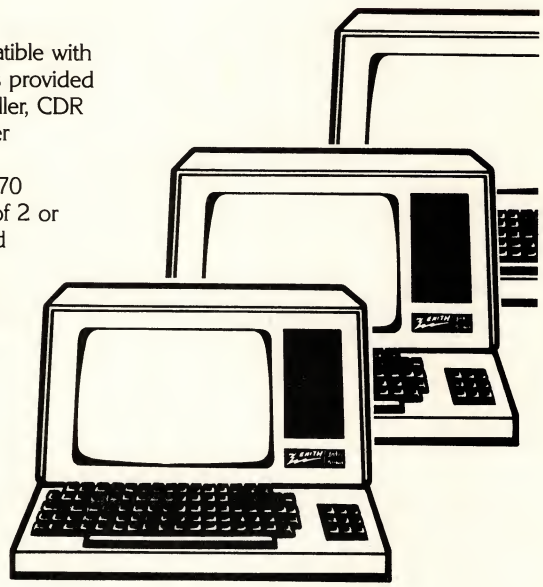
Expanded facilities of the BIOS include a built-in RAM Disk with capacity up to 170 Kbytes; a 48 Kbyte RAM print spooler; transparent operation at CPU clock rates of 2 or 4 MHz; increased TPA (Transient Program Area) for larger user programs; detailed error messages and user selection of recovery options; real-time clock support; simplified, self-prompting, configuration utility that is truly user-friendly; also, included are several useful utilities for expanded system operation. The Super 89 BIOS is available separately, $60.



THE SUPER 89

The DG SUPER 89 is a replacement central processor board for the Heath/Zenith 88-89 series of computers. The DG SUPER 89 offers advanced features not available on the standard Heath/Zenith 88-89 such as 4 MHz operation, real-time clock, optional AM9511A arithmetic processor, up to 256K of bank selectable RAM with parity check, and HDOS, CP/M and MP/M compatibility. By incorporating the state-of-the-art technology of the Z80, the DG SUPER 89 offers the user increased speed and system reliability for years to come. Super 89 BIOS included. Full compatibility with all Health/Zenith software and hardware products is designed into the DG SUPER 89. Price: $699.00 (128K) – $739.00 (192K) – $779.00 (256K).

HEARTBEAT

The DG Heartbeat is a compact computer system designed to be hardware and software compatible with the popular Heath/Zenith Z89/90 computer product line. The Heartbeat offers advanced features not found on the standard Heath/Zenith computer such as 4 MHz operation, real-time clock/calendar, two RS-232 serial ports, five peripheral expansion slots, 128 Kbytes (expandable to 256 Kbytes) parity checked RAM and provisions for an optional AM9511 Arithmetic Processor. Compatible with HDOS, CP/M and MP/M II (Multi-user) operating systems. Super 89 BIOS included. The Heartbeat may be used with most popular video terminals on the market although the Heath/Zenith H/Z19, H/Z29 and ZT-10/11 video terminals are recommended for full Heath/Zenith software compatibility. The Heartbeat cabinet design provides for inclusion of hard and/or floppy disk drives as well as other desired peripheral interfaces and is color-coordinated for use with the Zenith Z29 and ZT-10/11 video terminals. Price: $995.00 (128K) – $1075 (256K).

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```
C - CREATE A DOCUMENT
R - REVISE A DOCUMENT
V - VIEW A DOCUMENT
P - PRINT A DOCUMENT
M - MERGE A DOCUMENT
A - ADDITIONAL PROCEDURES

Starting menu

.

C - COPY A FILE
D - DELETE A FILE
T - SET TIME-DATE
A - ASSIGN CP/M FILE
R - READ CP/M FILE
W - WRITE CP/M FILE
E - EXIT WORD PROC
  WHITE OR BLUE TO RETURN

Additional Procedures Menu
```

Figure 1. Benchmark's starting and additional-procedures menus are kept brief.

will steer the program into its next stage?

No such problem would have been experienced if it had been Benchmark. In Benchmark, there are menus; but they are kept simple. A step presenting a menu or a choice is carefully accompanied by prompts. So anyone can become a demonstrator in a few moments.

In fact, if you are one of the individuals who prefer to put off using a manual until all else fails, then you will meet a real match for your particular brand of intelligence. The instruction manual is easy to follow and the index can be used to bypass the menus and windows if you prefer. But one ten-year-old explored Benchmark for four days before he had to consult the manual.

Starting out

For instance, when you first start a session, a menu will remind you of the print-format parameters in the event you wish to change any. When all its parameters have been selected, the screen invites you to insert your text.

Only a minimum amount of program information is displayed on the screen. At top left, you see whether you are in the Insert mode (for ordinary text entry) or in the Control mode (where you can manipulate the entire file, as when you do a search and replace, say). The name of the current file is also given at top left. At the top right, there is a valuable indication of cursor position, line, and page. Immediately under that is the printer status.

There is no clutter at all on the screen. But help is immediately made available if an error is made, or if the ? key is struck in Control mode. In Control mode, every letter of the alphabet forms a single-stroke instruction.

Benchmark comes to you on two 5¼" disks. It operates in a CP/M environment, so your boot disk will contain Benchmark, the CP/M operating system, and a configuration of CP/M's BIOS to match the peripherals. The DRV disk will configure Benchmark for your terminal. Then you place the Benchmark disk OP1 in drive B. The Benchmark RUN command will bring you the starting menu shown in Figure 1. It will offer you the option to create a document, revise one, etc. (Then Benchmark will prompt you to put your data disk in drive B.)

A return to this starting point is easy: just use the BLUE function key (instead of the WHITE, which continues any selected control operation). All the top row of keys are used. For example, f1 and f2 let you set the page and print format. The 12-key numeric keypad can be used for either cursor control or numeric input.

After you have entered text, you can place the program in Control mode with a single keystroke. All modes can be reached with the ? key, which brings choices on the screen, such as Print, Edit, or Finish the document.

If Benchmark's default printing parameters do not match your needs, the format can be changed. By the time you reach this stage, many of the advantages of Benchmark will be apparent. The simplicity of single keystrokes compared to the four or five required by other programs is just one more admirable trait.

Girl Friday

The closest approach to artificial intelligence is made by a feature which can be valuable to any operator. In Control Mode, a single keystroke, "L", allows any phrase to be stored on disk and then allotted to any lower- or uppercase letter. This phrase (which can be up to 2,000 characters long) can later be recalled and inserted into your text by hitting the BLUE key followed by the appropriate letter.

A single keystroke will then bring the document, business form, legal paper, form letter, or perhaps an inventory to the screen; there, it can be entered into the manuscript you are working on. (Since there are 52, this feature might be used for something that is different for each week of the year.)

Control features offered by other word processors are available in Benchmark, including searching for particular character strings, replacing them, moving blocks of text, and jumping to a new location within the file.

In control mode while editing the script, J-ump, S-earch, M-ove, B-ottom, and 5-home, are used most often. We have all probably written over a valuable file by mistake, or exited the word processor before saving a file. Benchmark averts the catastrophy of a disastrous command by giving you an advisory or a warning and a request for instructions.

Some users have commented on the delays which follow some commands; but even fast typists will not be held up if they type ahead of the display fill-in. And unlike other processors, it is almost impossible to confuse Benchmark's paragraph reformat or linewrap complexities.

Benchmark can also handle files that are larger than available memory. But it runs faster in systems with large memories since searching a file in RAM takes much less time than stepping through one which Benchmark has to break up and swap back and forth between RAM and disk.

Printing

Benchmark has the unusual capability of matching virtually every make of printer, dot-matrix and daisywheel. Printing can be carried out in any operating mode including Insert, Edit, View, or Print; and the process can be commenced at any point in the manuscript. If the layout parameters are not acceptable, the printing can be stopped and changes inserted.

Benchmark offers all the popular printing features, including proportional spacing, boldface, overstrike, shadow, font changes, super- and subscripts, underlining, tabs, centering, justification, and single-page printing.

Printing style and page format can be changed at any point in the text. When you put a format change in the document, Benchmark keeps you informed without taking up a lot of space on screen. A pound sign (#) for format, or a caret (^) for printing style, is automatically placed on the screen at the appropriate point, but not printed. Going to the sign and hitting the f1 or f2 key will display the parameters. (Erasing these signs will cause a return to the default settings.)

Other features permit mailing lists to be merged with letters; and limited graphics can be intermixed with the text.

The latest versions

When Benchmark version 3 was introduced in 1982, a total of twenty new features were added. The text displayed on the screen is identical in form to that of the printed document, including centering and justification. Single-line scroll is an alternative to screen scroll. Horizontal scrolling (up to 155 columns) is useful for very wide financial documents. The keypad can be used to input numbers and calculate totals vertically as well as horizontally, with independent column control. And there is a set of graphics editing symbols.

Version 3 is available under both CP/M and the Microsoft Disk Operating System (MS-DOS). And there is now a Version 4 available under MS-DOS.

Few word processors have all the features of Benchmark. It gives you hard-disk compatibility and drivers to match most terminals and printers. It allows footnoting and lets you protect against "widows" and "orphans" (word fragments or single words occurring as the last line of a paragraph or first line of a page). And it allows you complete document identification, including a name up to 29 characters long with author and time note. The Benchmark word processor can be interfaced with the other Metasoft programs that go under the "Benchmark" label: a spelling checker, a data manager, a graphics module, and a financial planner. Together, they can fill the needs of a large business, or of a lawyer's, doctor's, or other professional office. Yet the word processor is so easy to use that it is ideal for personal computers.

Even Benchmark's family history is unusual. Michael Echeverria, one of the partners of a law firm in Phoenix, had used a computer in his business but found that the early word processors were unsatisfactory. He bought one of the first desk-toppers in 1977 and then wrote Autoscribe—which was an instant success at the next National Computer Conference.

So Metasoft was founded and Autoscribe marketed for several computers including the North Star. This program impressed Zenith and a version was written for the H/Z89.

The latest release of Benchmark runs on the H/Z100, as well as sixteen other systems at the last count. Benchmark programs and the H/Z100 have been selected for MED-NET, the satellite-coupled, across-the-nation medical-information network. (A $2,300 version of Benchmark named Wordplus has been written for dedicated computers.)

A caution

In using Benchmark, I have come across only one problem that needs to be noted. And if you use Benchmark exclusively for "in-house" uses, you will probably never notice it.

Benchmark sprinkles quite a number of control characters and escape sequences throughout a file. Stored on disk and read by Benchmark, these take care of things like print formatting.

The problem is that you can't strip these characters out of the file. So you may run into trouble if you mail a disk to a friend, or transmit a file over a modem line. Well, *you* may not have any trouble, but your friend's word processor may not know how to cope with those "funny characters."

And it is doubtful that even a filter program would be much help. The sequences are complex and sometimes begin with an ordinary character. Stripping out the control codes would still leave undesired characters in your file.

(This applies only to versions 2 and 3, by the way. Version 4 allows you to send a plain-ASCII file devoid of anything unusual.)

Conclusion

The Benchmark word processor, with its balance of sophistication and simple candor, defies a really concise description—except for one. If you wish to use your computer as a typewriter, Benchmark will take you any place you want to go.

If you have driven a variety of fine U.S. cars and then suddenly switched to a Jaguar or Mercedes, you have been amazed by these vehicles' exceptional performance. They completely isolate you from road surfaces, yet maintain a real sense of road-feel and driver control. These complex machines filter out all useless sensations, passing to the driver the responsibility of making decisions on only those issues which are important.

"For the first time you will truly realize what is meant by the word *transparent*."

So it is with Benchmark, crafted with elegance, truly living up to its well chosen name.

Ordering Information

The Benchmark Word Processor, version 3 (CP/M, MS-DOS), $350; with spelling checker and mail list, $475.
Version 4 (MS-DOS on Z100, Z150) with spelling checker, $395.
Benchmark/Metasoft
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Richard H. Hirsch

Are you tired of typing in the time of day and the date whenever you turn on your Z100? If you are, then you need a real-time clock for your Z100.

Now, there are clock boards available that should work with the Z100's S-100 bus. But the S-100 boards are generally quite expensive. And there is the problem of software to drive the board. There is no guarantee the board will come with support for the Zenith Disk Operating System (Z-DOS).

For these reasons and because I like to design and build hardware, I decided to build my own clock board. It plugs into one of the Z100's four S-100 expansion slots.

With the clock board and associated software described here, the time and date will automatically be loaded into Z-DOS whenever the Z100 is turned on. An important benefit of this is that files will be time-stamped when they're created, so you'll know which ones are most recent. Also, the correct time will be displayed on the screen when the board is used with Patrick Swayne's SCRNCLK program. (See *REMark*, "Clock Watcher's Delight #2," May 1984, and "Clock Watcher's Delight (The Final Chapter)," November 1984.)

The circuit

The circuit for the real-time clock board is shown in Figures 1 and 2. The heart of the clock is OKI Semiconductor's MSM5832 integrated-circuit (IC) chip. This clock chip (IC8) provides everything you need for a dandy computer clock, including the ability to be powered by battery when the computer is off.

The MSM5832 chip is connected to a 6821 peripheral interface adapter (PIA) chip. The PIA (IC7) will input and output clock data and supply the necessary control signals for the clock chip. Its functions are programmed by sending appropriate signals to various pins via the S-100 bus. These signals are produced by the programs discussed below.

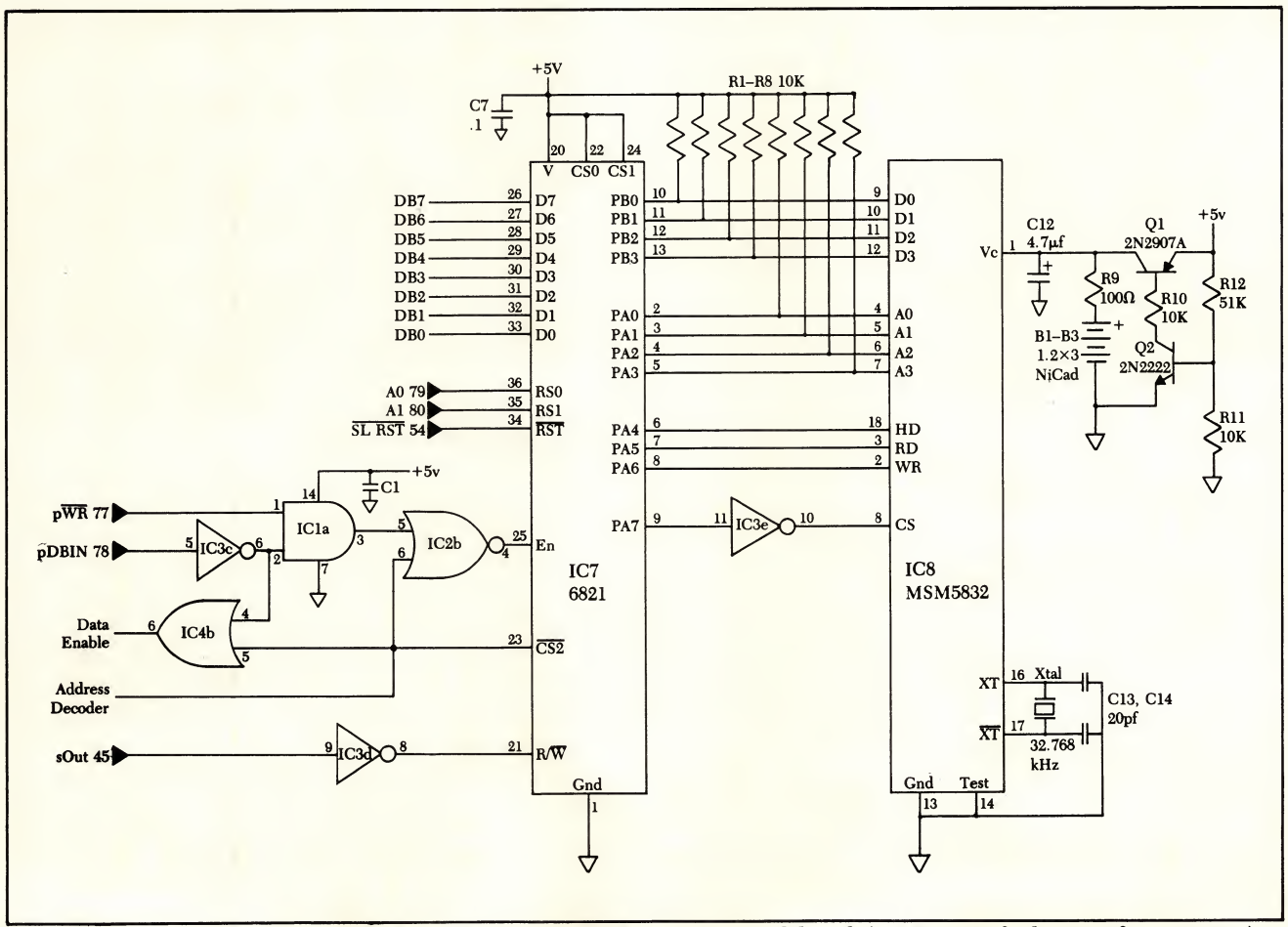

Figure 1. Schematic of the clock and clock-interface circuitry of the real-time clock board. (See Figure 2 for bus-interface circuitry.)

The 6821 PIA enables us to read the year, month, day, hour, minute, and second. (I used a 6821 chip and it works fine, but you might want to use a 68A21 or 68B21 chip, if you can find them. These are faster versions of the 6821 chip.)

The PIA is designed to be used with a single bi-directional data bus. However, the Z100 has an S-100 bus structure, which means that it uses different data-input and data-output buses.

Therefore, we need to furnish a bi-directional bus buffer. This job is handled by IC5 and IC6. A data-enable line (going to pins 1 and 19 on both IC5 and IC6) is used to control reading data from, or writing data to, the Z100's data buses from the PIA.

Another necessary control line is the address-decoder line (coming from pin 23 of IC7). This will activate the PIA when we address the I/O ports (124, 125, 126, and 127) that are used for programming it. Address decoding is done primarily by IC9.

A thorough and readable discussion of the S-100 bus can be found in the book *Interfacing to S-100/IEEE 696 Microcomputers*, by Sol Libes and Mark Garetz, McGraw-Hill, 1981.

Power for timekeeping when the computer is off is provided by three NiCad AAA cells. To prevent draining the batteries through the Z100's power supply when the computer is off, a voltage-sensitive switch based on transistors Q1 and Q2 is used. This switch also directs power to the clock chip and allows the batteries to charge when the computer is on.

One unusual feature of this circuit is that the chip-select (CS) pin of the clock chip (pin 8, IC7) is not connected to +5 volts, as the MSM5832 data sheet suggests. When I connected the CS pin to +5 volts, the clock consistently lost time whenever the computer was powered up. I believe that invalid data was being written to the clock chip during the power-up phase.

To prevent that from happening, I tied the clock chip's CS line (pin 8, IC8) to pin 9 of the PIA (IC7) through an inverter gate (IC3e). When powered up, pin 9 of the PIA goes high. Because of IC3e, pin 8 of the clock chip is held low and the clock chip cannot accept data. It is only when we read or set the clock that we program the PIA to raise the CS line to activate the clock chip.

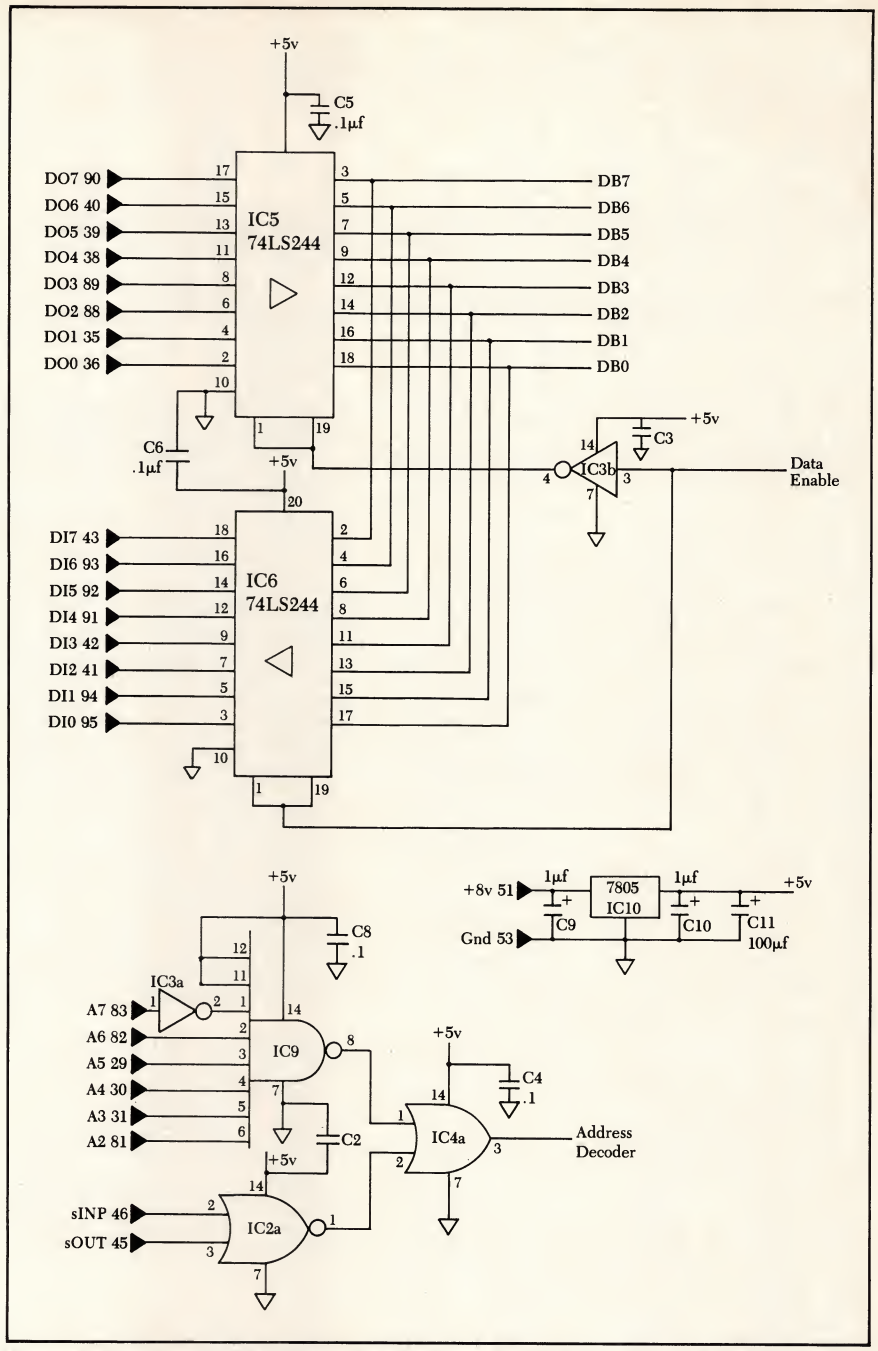

Figure 2. Schematic of the bus-interface circuitry. (See Figure 1 for clock and clock-interface circuitry.)

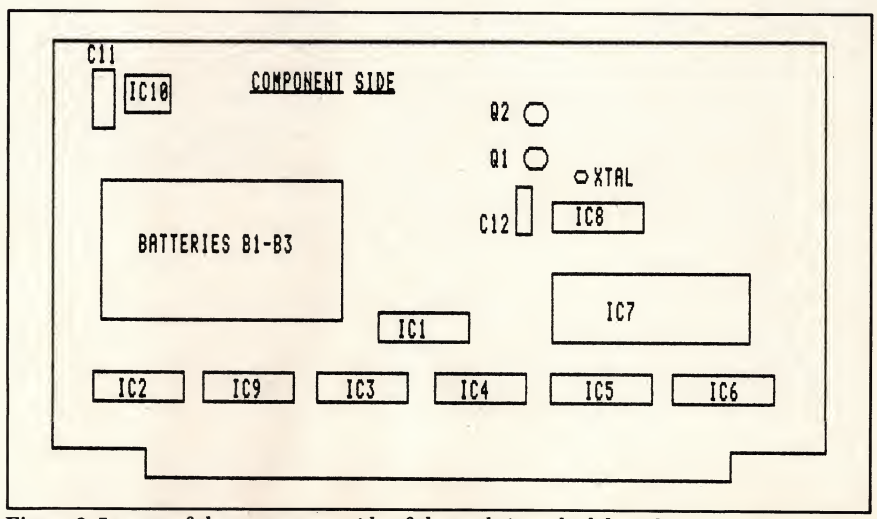

Figure 3. Layout of the component side of the real-time clock board.

Construction

The clock board was built using wire-wrap techniques on a Vector 8801-1 S-100 perforated plugboard; the entire board was constructed in about three evenings. Parts layout on the plugboard is not critical; it was accomplished in such a way that wiring connections were as short as possible. (See Figure 3.) Because the clearance on both sides of the plugboard is limited, tall components

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Circle #143 on Reader Service Card

should be mounted horizontally and socket pins should be trimmed.

One 0.1 microfarad decoupling capacitor per IC was used for ICs 1 to 7, and IC9. They are connected between pins 14 and 7.

IC1, 2, 3, and 4 all have logic gates that were not used in this design. Although not shown in the schematic, the inputs of these unused gates were connected to their ground pins. The connections are as follows:

IC1, connect pins 4, 5, 9, 10, 12, and 13 to pin 7.

IC2, connect pins 8, 9, 11, and 12 to pin 7.

IC3, connect pin 13 to pin 7.

IC4, connect pins 9, 10, 12, and 13 to pin 7.

Parts were obtained from Digi-Key of Thief River Falls, Minnesota; Jameco of Belmont, California; and my local Radio Shack. Total cost for parts was about $50.

Whenever you boot the system, the Z-DOS clock is automatically set.

You should be aware that if your hardware is poorly executed, you can do grievous harm to your computer. If you mis-wire the board, have a solder bridge, or make even one of many other possible errors, you can seriously damage your Z100.

Chances of hurting the board or Z100 are much less if you carefully check the wiring before installing the board. In addition, the board is more likely to work properly.

Before plugging in any chips, I use an ohmmeter to check for the correct resistance to make sure that every IC socket pin is connected to whatever it should be connected to—and nowhere else. Do this before installing the chips. After the board is checked, install the chips and plug the board into the Z100. Note that you should *never* plug in or unplug a board with the Z100 on.

Software: setting the clock

Three programs are provided to drive the board. The first, OKISET.BAS, is presented in Listing 1 and is used to set the real-time clock board.

Lines 110-150 input the necessary time data, while lines 160-260 modify this data to accommodate the 4-bit data bus of the MSM5832 clock chip.

The statement in line 200 needs some clarification. The clock chip can be programmed to present the time in either a 12- or 24-hour format. When the clock is set, the 24-hour format is selected by adding +8 to the hour tens value. Otherwise, the time will be presented in a 12-hour format.

For the 24-hour format, line 200 is

```
D(5)=INT(D(24)/10) + 8
```

For a 12-hour format, change line 200 to

```
D(5)=INT(D(24)/10)
```

Lines 300-440 program the PIA and load the time data into the MSM5832.

As noted above, we program the PIA to raise the CS line to activate the clock chip when we read or set the clock. In OKISET.BAS, this is accomplished in line 360. (In OKIREAD.BAS, Listing 2, it is done in line 180. In READTIME.ASM, Listing 3, see the statement "OUT PORTA, AL", where AL contains the value zero.)

Note that because of the way the MSM5832 chip is wired to the PIA, when we want to activate the chip-select (CS) line, we output a "0" on bit 7 of PIA port A. To activate the write (WR), read (RD), or hold (HD) lines, we

```
10 ' ****************************************************************
20 ' *                                                              *
30 ' *    OKISET.BAS  WRITTEN BY J. AND R. HIRSCH, 10-84, VER. 1.1  *
40 ' *          PROGRAM TO SET THE S100 REAL-TIME CLOCK             *
50 ' *                       FOR THE Z100                           *
60 ' *                                                              *
70 ' ****************************************************************
80 DIM D(30):COLOR 7,1:CLS
90 CS=128:WR=64:RD=32:HD=16                    :REM LINE ADDRESSES
100 PA=124:CRA=125:PB=126:CRB=127              :REM PORT ADDRESSES
110 INPUT "What year is it (0-99)             ";D(28)
120 INPUT "What month is it (0-12)            ";D(27)
130 INPUT "What day of the month is it (0-31) ";D(26)
140 INPUT "What hour is it (0-23)             ";D(24)
150 INPUT "What minute will it be (0-59)      ";D(23)
160 D(0)=0:D(1)=0                  :REM SET SECONDS = 0
170 D(2)=D(23) MOD 10              :REM MINUTE UNITS
180 D(3)=INT(D(23)/10)             :REM MINUTE TENS
190 D(4)=D(24) MOD 10              :REM HOUR UNITS
200 D(5)=INT(D(24)/10)+8           :REM HOUR TENS AND FORMAT SELECT
210 D(7)=D(26) MOD 10              :REM DAY OF MONTH UNITS
220 D(8)=INT(D(26)/10)             :REM DAY OF MONTH TENS
230 D(9)=D(27) MOD 10              :REM MONTH UNITS
240 D(10)=INT(D(27)/10)            :REM MONTH TENS
250 D(11)=D(28) MOD 10             :REM YEAR UNITS
260 D(12)=INT(D(28)/10)            :REM YEAR TENS
270 PRINT:PRINT"Hit RETURN to start clock"
280 D$=INKEY$: IF D$><CHR$(13) THEN 280
300 OUT CRA, 0             :REM SET UP CONT. REG A SO PORT A IS DDRA
310 OUT CRB, 0             :REM  DO THE SAME FOR PORT B
320 OUT PA, 255            :REM PUT 255 IN DDRA SO PORT A IS OUTPUT
330 OUT PB, 255            :REM  DO THE SAME FOR PORT B
340 OUT CRA, 4             :REM SET UP CONT. REG A SO PORT A IS USEABLE
350 OUT CRB, 4             :REM  DO THE SAME FOR PORT B
360 OUT PA, 0                    :REM ASSERT CHIP SELECT LINE
370 OUT PA, HD                   :REM ASSERT HOLD LINE
380 FOR I=0 TO 12
390 OUT PA, HD + I               :REM SELECT REG TO WRITE TO
400 OUT PB, D(I)                 :REM OUTPUT DATA
410 OUT PA, HD + I + WR          :REM ASSERT WRITE LINE
420 NEXT I
430 OUT PA, CS                   :REM DROP REMAINING LINES
440 PRINT:PRINT"            Clock set!!!":PRINT:PRINT
450 REM REMAINDER OF PROGRAM READS THE TIME
460 PRINT:PRINT  "THE CLOCK READS . . . ":PRINT
470 DIM T(30):COLOR 7,1
480 CS=128:WR=64:RD=32:HD=16:PA=124:CRA=125:PB=126:CRB=127
490 OUT CRB, 0             :REM SET UP CONT. REG B SO PORT B IS DDRB
500 OUT PB, 0              :REM PUT 0 IN DDRB SO PORT B IS INPUT
510 OUT CRB, 4             :REM SET UP CONT. REG B SO PORT IS USEABLE
520 OUT PA, 0                    :REM ASSERT CHIP SELECT LINE
530 OUT PA, HD                   :REM ASSERT HOLD LINE
540 OUT PA, HD + RD              :REM ASSERT READ LINE
550 FOR I=0 TO 12
560 OUT PA, HD + RD + I          :REM SELECT REG TO READ FROM
570 T(I)=INP(PB)                 :REM INPUT DATA
580 NEXT I
590 OUT PA, CS                   :REM DROP ALL LINES
600 T(22)=T(0)+T(1)*10           :REM SECONDS
610 T(23)=T(2)+T(3)*10           :REM MINUTES
620 T(24)=T(4)+(T(5)-8)*10       :REM HOURS
630 T(26)=T(7)+T(8)*10           :REM DAY OF THE MONTH
640 T(27)=T(9)+T(10)*10          :REM MONTH
650 T(28)=1900+T(11)+T(12)*10    :REM YEAR
660 PRINT "Time is:    ";T(24);":";
670 IF T(23)<=9 THEN PRINT "0";T(23); ELSE PRINT T(23);
680 PRINT " and ";T(22);" seconds ":PRINT
690 PRINT "Date is:    ";T(26);"th day of the ";T(27);"th month, ";T(28)
700 END
```

Listing 1. OKISET.BAS sets the real-time clock.

output a "1" on bit 6, 5, or 4, respectively, of PIA port A.

Lines 450-690 read the clock board and display the time on the screen. This final portion of the program is similar to the program OKIREAD.BAS, shown in Listing 2.

Troubleshooting

Chances are good that, when the board is installed, it will work if you carefully checked it before installation. If it doesn't, start troubleshooting by first checking to make sure there were no errors made in typing in the software.

If the software is correct, check for the address-decoder signal, using a logic probe on pin 23 of the PIA. In BASIC, execute an "OUT 124,255" command and look for a low pulse. If it's present, the address-decoder section is probably all right.

Next, check the operation of the PIA by executing "OUT 125,0", "OUT 127,0", "OUT 124,255", "OUT 126,255", "OUT 125,4", and "OUT 127,4". This sequence programs ports A and B of the PIA to be output ports.

Then check the individual bits of port A with a logic probe with "OUT 124,XXX", where XXX equals 1, 2, 4, 8, 16, 32, 64, and 128. Each bit should respond properly. For example, execute "OUT 124,2". Since 2 decimal equals 00000010 binary, pin 3 (port A, bit 1) should test high with the logic probe, while pins 2 and 4-9 (port A, bits 0 and 2-7) should test low.

Do the same test for port B using "OUT 126,XXX". If the ports don't respond correctly, there is probably a problem with the way the PIA or bus buffer was wired.

Other test points that may prove useful on the PIA are the R/W and EN pins (IC7, pin 21 and pin 25). You can check the data-enable line, and you can also check the pins on the MSM5832. Check these pins for the proper signals while executing BASIC INP and OUT commands.

Reading the clock

The function of OKIREAD.BAS, as you might expect, is to read the real-time clock board and display the time and date on the screen.

The third program, READTIME.ASM, is presented in Listing 3; it reads the real-time clock board and then loads the time data into the Z100's Z-DOS clock.

To be used, READTIME.ASM needs to be assembled with MASM, linked with LINK, and then converted to READTIME-.COM with EXE2BIN. (The assembly procedure can be found in Appendix P, page P-5 in the Z-DOS manual. Don't forget to erase READTIME.EXE from the disk before running READTIME.COM.)

READTIME.COM should then be put into an AUTOEXEC.BAT file so that whenever you boot the system, the Z-DOS clock is automatically set. I also include

```
10 ' ****************************************************************
20 ' *                                                              *
30 ' *    OKIREAD.BAS  WRITTEN BY J. AND R. HIRSCH, 10-84, VER. 1.1 *
40 ' *              PROGRAM TO READ THE S100 REAL-TIME CLOCK        *
50 ' *                          FOR THE Z100                        *
60 ' *                                                              *
70 ' ****************************************************************
80 DIM T(30):COLOR 7,1:CLS
100 CS=128:WR=64:RD=32:HD=16                    :REM LINE ADDRESSES
110 PA=124:CRA=125:PB=126:CRB=127               :REM PORT ADDRESSES
120 OUT CRB, 0            :REM SET UP CONT. REG B SO PORT B IS DDRB
130 OUT CRA, 0            :REM  DO THE SAME FOR PORT A
140 OUT PB, 0             :REM PUT 0 IN DDRB SO PORT B IS INPUT
150 OUT PA, 255           :REM PUT 255 IN DDRA SO PORT A IS OUTPUT
160 OUT CRB, 4            :REM SET UP CONT. REG B SO PORT IS USEABLE
170 OUT CRA, 4                  :REM  DO THE SAME FOR PORT A
180 OUT PA, 0                   :REM ASSERT CHIP SELECT LINE
190 OUT PA, HD                  :REM ASSERT HOLD LINE
200 OUT PA, HD + RD             :REM ASSERT READ LINE
210 FOR I=0 TO 12
220 OUT PA, HD + RD + I         :REM SELECT REG TO READ FROM
230 T(I)=INP(PB)                :REM INPUT DATA
240 NEXT I
250 OUT PA, CS                  :REM DROP ALL LINES
270 T(22)=T(0)+T(1)*10          :REM SECONDS
280 T(23)=T(2)+T(3)*10          :REM MINUTES
290 T(24)=T(4)+(T(5)-8)*10      :REM HOURS
300 T(26)=T(7)+T(8)*10          :REM DAY OF THE MONTH
310 T(27)=T(9)+T(10)*10         :REM MONTH
320 T(28)=1900+T(11)+T(12)*10   :REM YEAR
330 PRINT "The time is:  ";T(24);":";
340 IF T(23)<=9 THEN PRINT "0";T(23); ELSE PRINT T(23);
350 PRINT " and ";T(22);" seconds ":PRINT
360 PRINT "The date is:  ";T(26);"th day of the ";T(27);"th month, ";T(28)
370 END
```

Listing 2. OKIREAD.BAS reads the real-time clock and displays the time and date on the screen.

Listing 3. READTIME.ASM, assembled, will read the real-time clock and load the time into Z-DOS's clock.

```
;TITLE: READTIME - VERSION 1.2
;    READS TIME AND DATE FROM Z100 REAL-TIME CLOCK BOARD
;    AND LOADS Z100 DOS CLOCK.  PROGRAM BY R. HIRSCH, 11-84

;DOS FUNCTIONS (INT21H):
;
; SET DATE ah=2bh, cx gets yr (0-2000), dh gets mon (0-12),
;          dl gets day (0-31)
; SET TIME ah=2dh, ch gets hrs (0-24), cl gets min (0-59),
;          dh gets seconds (0-99), dl gets hundredths of a sec (0-99)

;Line Definitions:
;
;  Bit:    7(80H)  6(40H)  5(20H)  4(10H)   3       2       1       0
;
; PORT A   CS      WR      RD      HD       A3      A2      A1      A0
; PORT B   x       x       x       x        D3      D2      D1      D0
;
;             ** NOTE THAT AS WIRED, CS IS ACTIVE WHEN LOW **
;
CODE    SEGMENT PARA PUBLIC 'CODE'
        ASSUME CS:CODE, DS:CODE, SS:CODE
        ORG 100H
;
;SET UP 6821 PPI
START:  SUB AL,AL               ;AL=0
        OUT CRA,AL            ;SET UP CONT. REGISTER SO PORTA IS DDRA
        OUT CRB,AL              ; DO THE SAME FOR PORTB
        OUT PORTB,AL            ;PUT 0 IN DDRB (ALL INPUTS)
        MOV AL,255
        OUT PORTA,AL            ;PUT 255 IN DDRA (ALL OUTPUTS)
        MOV AL,4
        OUT CRA,AL            ;SET UP CONT. REG. SO PORTA IS USEABLE
        OUT CRB,AL              ; DO SAME FOR PORTB
;
;GET THE TIME DATA
        MOV BX,0
        MOV AL,BL
        OUT PORTA,AL            ;ASSERT CHIP SELECT LINE
        MOV AL,10H
        OUT PORTA,AL            ;ASSERT HOLD LINE                  →
```

```
        MOV AL,10H+20H
        OUT PORTA,AL            ;ASSERT READ LINE
GETDATA: MOV AL,10H+20H
        ADD AL,BL               ;SELECT REGISTER TO READ FROM
        OUT PORTA,AL
        CALL WAIT
        IN AL,PORTB             ;READ DATA
        AND AL,0FH              ; SAVE LOWER FOUR BITS
        MOV BUFFER[BX],AL       ; AND STORE THEM IN BUFFER
        INC BX
        CMP BL,13
        JNE GETDATA
;RELEASE CONTROL LINES
        MOV AL,80H+20H      ;DISABLE CHIP SEL, WRITE, AND HOLD FUNCT
        OUT PORTA,AL

;NOW WE MANIPULATE DATA
;FIRST SET UP FOR SET DATE DOS FUNCTION

        MOV BL,10               ;BL=10

        MOV BH,BUFFER[9]        ;FIRST DO MONTHS
        MOV AL,BUFFER[10]
        MUL BL
        ADD AL,BH
        MOV DH,AL               ;STORE MONTHS IN DH

        MOV BH,BUFFER[7]        ;DO DAY OF MONTH
        MOV AL,BUFFER[8]
        MUL BL
        ADD AL,BH
        MOV DL,AL               ;STORE DAY OF MONTH IN DL

        MOV BH,BUFFER[11]       ;DO YEAR
        MOV AL,BUFFER[12]
        MUL BL
        ADD AL,BH
        SUB AH,AH               ;AH=0
        ADD AX,1900
        MOV CX,AX               ;STORE YEAR IN CX
;
        MOV AH,2BH
        INT 21H                 ;CALL SET DATE FUNCTION
;
;SECOND, SET UP FOR SET TIME DOS FUNCTION

        MOV BL,10               ;BL=10

        MOV BH,BUFFER[4]        ;FIRST DO HOURS
        MOV AL,BUFFER[5]
        AND AL,3                ;SAVE LOWER TWO BITS
        MUL BL
        ADD AL,BH
        MOV CH,AL               ;STORE HOURS IN CH

        MOV BH,BUFFER[0]        ;DO SECONDS
        MOV AL,BUFFER[1]
        MUL BL
        ADD AL,BH
        MOV DH,AL               ;STORE SECONDS IN DH

        MOV BH,BUFFER[2]        ;DO MINUTES
        MOV AL,BUFFER[3]
        MUL BL
        ADD AL,BH
        MOV CL,AL               ;STORE MINUTES IN CL
;
        SUB DL,DL               ;SET DL=0  (HUNDREDTHS OF SECONDS)
;
        MOV AH,2DH
        INT 21H                 ;CALL SET TIME FUNCTION
        INT 20H                 ;RETURN TO DOS
;
WAIT    PROC    NEAR        ;SUBROUT TO DELAY UNTIL LINES SETTLE
        MOV CX,64           ;  USE IF CLOCK SPEED IS 7.5MHZ
DLAY:   LOOP DLAY
        RET
WAIT    ENDP
;
PORTA           EQU     124         ;PORT A ADDRESS
CRA             EQU     125         ;6821 CONTROL REGISTER A
PORTB           EQU     126         ;PORT B ADDRESS
CRB             EQU     127         ;6821 CONTROL REGISTER B
BUFFER          DB      13      DUP(?)
;
CODE    ENDS
        END     START
```

Patrick Swayne's SCRNCLK program in AUTOEXEC.BAT to display the time.

READTIME.COM is 180 bytes long, and so takes up very little disk space. READTIME works at the Z100's normal clock speed of 5 MHz—and also at 7.5 MHz if you use a ZS100 Speed Module from C.D.R Systems of San Diego, California. It also works with MS-DOS version 2.0.

In terms of how the program READTIME works, I hope the comments help you to understand what's happening. It should help to read OKIREAD.BAS, since similar logic was used to write both programs.

Ordering Information

Digi-Key
Highway 32 South
Thief River Falls, MN 56701

Jameco
1355 Shoreway Road
Belmont, CA 94002 △

Resistors (All resistors are 5% tolerance, ¼ watt.)

R1-R8	10 kilohms
R9	100 ohms
R10, R11	10 kilohms
R12	51 kilohms

Capacitors

C1-C8	0.1 microfarads
C9, C10	1 microfarad, 35 volts, tantalum
C11	100 microfarads, 16 volts, electrolytic
C12	4.7 microfarads, 15 volts, tantalum
C13, C14	20 picofarads, ceramic disk

Semiconductors

IC1	74LS08	AND gate
IC2	74LS02	NOR gate
IC3	74LS04	hex inverter (NOT gate)
IC4	74LS32	quad OR gate
IC5	74LS244	octal line driver
IC6	74LS244	octal line driver
IC7	6821, 68A21, or 68B21	peripheral interface adapter
IC8	MSM5832	real-time clock (from Digi-Key)
IC9	74LS30	NAND gate
IC10	7805	positive 5-volt regulator
Q1	2N2907	PNP transistor
Q2	2N2222	NPN transistor

Other components

S-100 plugboard	Vector 8801-1 (from Jameco)
Xtal	32.768 kHz crystal (from Digi-Key)
B1-B3	AAA NiCad 1.2-volt batteries

battery holder for three AAA cells
IC sockets: five 14-pin, one 18-pin, two 20-pin, one 40-pin

Table 1. Parts list for the real-time clock board.

HEATH/ZENITH SPOKEN HERE...

ZENITH IBM COMPATIBLE COMPUTERS, Z-150 SERIES

ZF-151-21. One 360K floppy disk drive, 128K RAM, color ready $1752.00
ZF-151-52. As above with two floppy disk drives and 320K RAM $2147.00
ZW-151-52. As above but with 10.6 MEG Winchester Drive and one floppy disk drive $3320.00
ZFA-161-21 Portable. 9" Amber screen, About 33 lbs. All other features same as ZF-151-21 ..... $1883.00
ZFA-161-52 Portable. 9" Amber screen, Two 360K disk drives. All other features same as ZF-151-52 ..... $2280.00

UPGRADE ACCESSORIES FOR Z-100 SERIES COMPUTERS

Color Graphics Upgrade. All memory chips (16 pieces 150 ns) to update for color. Instructions included. Order Memory Kit #100-64-16 ..... $37.50
Memory Upgrade. All memory chips (9 pieces 150 ns) required to upgrade from 128K to 192K RAM. Installation instructions included. Order Memory Kit #100-64-9 ..... $18.90
UCI Memory Upgrade Card. 72 sockets for eight banks of either 64K or 256K memory chips (Dynamic RAM). Our price for the bare board is $455.00 or purchase with 256K chips installed as follows: 512K for $587.50, 1.0 MEG for $677.50, 1.5 MEG for $767.50, 2.0 MEG for $857.50.
UCI Z-100 Speed Module. Run at 8.0 MHz. Installs easily with no soldering. Externally switchable. Five replacement chips included $48.00
Z-216 8087 Numeric Co-Processor. Speeds and improves numeric processing. Retail $379.00, Payload price.... $325.00

UPGRADE ACCESSORIES FOR H/Z-89 COMPUTERS

Magnolia Microsystems Double Density Controller. Soft-sectored disk controller. Supports up to four each 5.25" and 8" disk drives. Complete with cables, installation instructions and CP/M 2.242 ..... $354.00
Magnolia Microsystems 128K RAM Board. Add to your 48K H/Z-89 CPU memory for a total of 176K. Includes CP/M Plus (CP/M 3.0), a $350.00 value, at no additional charge. Payload price $446.00
Magnolia Microsystems Memory Upgrade Card. Installs in your H-89 to increase memory from 48K to 64K. Payload price $68.50
Magnolia Microsystems SASI Bus I/O. Use to connect Winchester disk drives to your H-89. Also has three Serial Ports. Software included. Payload $225.00
Winchester Hard Disk Drive Set-up. Includes Hard Disk Drive, SASI Interface (above), power supply and case with fan, cables, Hard Disk Controller and CP/M software. $1122.00 for 10.5 MEG (formatted) set-up or $1559.00 for 20.0 MEG set-up.
Dual Internal Drive Set-up. Includes two half-height double sided disk drives and all hardware and connectors required to mount inside your H-89. Steel mounting shield/case included.
National JA551-2 Set-up, 48 TPI, 6 MS seek, 320K disks...$299.00
Mitsubishi 4851 Set-up, 48 TPI, 6 MS seek, 320K disks...$312.00
Mitsubishi 4853 Set-up, 96 TPI, 3 MS seek, 640K disks...$319.00

UPGRADE ACCESSORIES FOR Z-150/160 SERIES COMPUTERS

Memory Kit #150-64-9. Each kit will increase memory by 64K up to 320K. All 150 ns RAM chips, instructions included $18.90
Memory Kit #150-256-18. Includes a ZPAL chip which allows use of 256K RAM chips. Includes 18 pieces 256K 150 ns RAM chips. Kit increases 128K memory to 640K. Over 128K increases to 704K. Unbelievable but true $144.00
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ZCPR—A Public Domain Enhancement for CP/M's Command Processor

You can vastly improve CP/M's user interface at almost no cost.

Mitchell S. Ross

ZCPR is the type of software that makes you wonder how you got along without it. ZCPR is the Z80 Command Processor Replacement; when you have installed it on your computer, you will have improved the capabilities of all of CP/M's resident commands—and added at least five new resident commands—without losing any disk space. All pluses with no fusses!

The CP/M operating system was written for the 8080 central-processor unit (CPU). As such, its power is limited to that of the 8080's instruction set. You can run CP/M on the Z80 CPU, since the Z80 accepts 8080 code. But the Z80's more powerful instructions go unused by the operating system.

ZCPR is a public domain software package which uses Z80 machine code to enhance CP/M's user interface. ZCPR consumes no additional space and retains compatibility with standard CP/M. Of course, to take advantage of ZCPR, you must have a computer with a Z80 processor (such as an H/Z89 or an H8 with a Z80 card).

I am always pleased to find a program in the public domain that is really useful. A lot of public domain software is available through local users' groups and bulletin boards. Much of it, however, either is poorly written or requires special hardware configurations. Occasionally, though, you run across a gem like ZCPR. It makes searching through all the "junkware" worth your time. The price is usually right, too.

One source for ZCPR is the Capital Heath Users' Group (CHUG), based in the Washington, D.C., area. Another is the Special Interest Group for Microcomputers (SIG/M) of the Amateur Computer Group of New Jersey. If you are a member of either of these groups or of other groups which have it, ZCPR is well worth the $5 or so you have to pay.

And if you're not a member of a users' group, several commercial vendors have made it available in various formats and in their own versions at a slightly higher price. GraphNet Systems, Inc. (formerly Extended Technology Systems) of Bensalem, Pennsylvania, for instance, has customized ZCPR for Heath/Zenith computers; they sell it along with support utilities for about $25.

Wouldn't it be nice?

All operating systems interface to the user in some way. The manner in which a computer handles commands and provides information back to the user is perhaps the most important aspect of the operating system. A flexible user interface allows greater user/machine communications and increases productivity.

> ***One area in CP/M that lacks sophistication is the user interface.***

One area in CP/M that lacks sophistication is the user interface. The existing commands are limited and the results are not always what is expected.

Have you ever used the TYPE command to display a file on the console—only to have it zip up the screen before you could reach for the control-S to stop the scrolling?

Wouldn't it be nice to be able to display system files with the DIRectory command?

Would you like to have additional commands and features available without sacrificing disk space? Without giving up RAM? And at the same time maintain compatibility with your original CP/M system?

Vendors offer all kinds of modifications for peripheral interfacing. But the most important interface, between the user and CP/M, has been neglected for the most part.

Digital Research claims that over 1,000 different types of systems are running CP/M on 700,000 machines. Over 3,500 programs are available for CP/M systems. CP/M boasts the most widely used software market in the entire world. You would think that with a volume of users and software this great someone would take the time to improve the user interface.

Someone has—with ZCPR.

Talking to CP/M

The CP/M interface to you, the user, is called the console command processor (CCP). When typing commands to CP/M, you are actually communicating with the CCP. The CCP will decide whether to execute the command as "resident," whether to search for a disk file to execute, or whether to reject your command as an invalid entry.

The standard CCP in CP/M contains five "resident" commands: DIR (for DIRectory); REN (for REName); ERA (for ERAse); TYPE a file to the screen; and SAVE an area in memory to disk. The resident commands are an integral part of the CCP and do not use any of the disk space available to the user. The CCP resides on the system tracks of the disk. The resident commands receive first priority by the CCP when it is searching for a command to execute.

When you type a command and it cannot be found among the resident commands, the disk is searched for a command file. A command file has the .COM extension, e.g., PIP.COM.

For example, if you type PIP, the CCP will search the resident commands. Since PIP is not a resident command, the CCP will search the currently logged disk for PIP.COM and execute it if PIP is on the disk. If PIP cannot be found, the CCP will return an error message. Usually the error message is what you typed followed by a question mark. (Such as: "PIP?") The search method the CCP uses is called the "search hierarchy."

Notice what would happen if you had a file named DIR.COM. When you typed DIR at your console, the CCP would first search the resident commands to see if DIR was among them.

It is, of course, and the DIRectory command would be executed. Your file DIR.COM could never be executed. The lesson to be learned is: with standard CP/M, never name a .COM file the same as one of the resident commands.

ZCPR to the rescue

The available commands and the search hierarchy of CP/M's CCP seem adequate for most purposes. But why is the CCP limited to only five resident commands? Why do the resident commands have such limited capability? Why is the command search hierarchy limited to two levels?

The answer to these questions can be found by examining how the standard CCP exists in relation to CP/M.

The CCP resides on the reserved tracks of a system disk, along with CP/M's basic disk operating system (BDOS) and basic input/output system (BIOS). (See Figure 1.) The CCP is two kilobytes in length and consumes eight sectors on a standard single-sided 8" disk (11 sectors on a 5¼" single-sided/single-density Heathkit disk).

CP/M is loaded into memory at a specific location, which in turn determines the location of the CCP. In the image in memory, the transient-program area (TPA) is located below the CCP; and the BDOS is located above it. CP/M expects to find the CCP in that specific location; the CCP is surrounded by the TPA on one side, and the BDOS on the other. So here we are, stuck with a specific length and location in relation to the rest of CP/M. How can the CCP be enlarged or improved?

As noted above, CP/M was originally designed to run on an 8080 processor; it is written entirely in 8080 assembly code. The H/Z89 and many other computers running CP/M are using the Z80 processor, which can execute 8080 machine code.

However, one advantage to using a Z80 is the more efficient set of instructions available to the Z80 processor. If Z80 assembly language were used to code the CCP, a more productive program would result in the same amount of space.

By "more productive," I mean more commands and enhancement of the existing commands. This is exactly what ZCPR does. ZCPR extensively uses opcodes unique to the Z80; and improved algorithms make a significant increase in the capabilities of the command processor.

The advantages of using ZCPR rather than the standard CCP are found in six areas:

1. Existing CP/M commands are expanded. With ZCPR, for example, the DIR command can display SYS files, non-SYS files, or both. The ERA command will display the names of the files it erases. The SAVE command will save by page or sector, in hexadecimal or decimal, instead of just saving by page in hex. The TYPE command will display one screen at a time or scroll continuously, as selected.
2. When you are logged into a particular user area, its number is displayed with the prompt; e.g., A2>.
3. The search hierarchy is significantly expanded.
4. ZCPR's source code is included to allow customization of commands.
5. Full compatibility with CP/M is retained.
6. There are additional commands which are an integral part of the new CCP—while ZCPR takes up no more room than the standard CCP. The new commands are:

GO – execute the program in the TPA.

JUMP XXXX – transfer control to memory location XXXX.

GET XXXX FN.EXT – load FN.EXT into memory at location XXXX.

LIST FN.EXT – output FN.EXT to the CP/M LST: device.

DFU X – change the number of the default user area to X.

New commands

The GO command executes whatever is located in the TPA (which starts at memory address 0100H). I have found this command very useful as a time saver and for saving disk accesses when using a program several times.

Have you ever used FORMAT.COM to format a disk—and exited the program, only to find you had another disk to format? You could run FORMAT.COM again; or, if you had ZCPR, you could just type GO. Since FORMAT.COM is still in the TPA, it is immediately executed—without a disk access and without waiting.

If you have ever exited PIP.COM before you really meant to, the same procedure will work. Type GO and the familiar "*" appears immediately. Of course, this will only work if the program in the TPA has not been stepped on by action taken after you exited it.

The JUMP command is similar to GO—but you can control where you begin execution. The GO command begins execution at 0100H; with the JUMP command, you must specify a starting address.

I have found this useful for troubleshooting and debugging. By typing JUMP 2B00, you will execute whatever is located at address 2B00H.

The GET command loads a file from the disk into memory starting at a specified address. For example, GET 4000 FILENAME.EXT will load FILENAME.EXT at 4000H. This is useful when used in conjunction with the JUMP command for program development and debugging.

The LIST command is used to output a file to the CP/M LST: device. For example, if you want a listing of a letter, documentation, or any text file, just type LIST FILENAME.EXT; and FILENAME.EXT will be sent to the printer. This is similar to, but neater than, the old procedure of typing control-P, TYPE FILENAME.EXT, control-P.

The TYPE command is very similar to the usual TYPE command with one im-

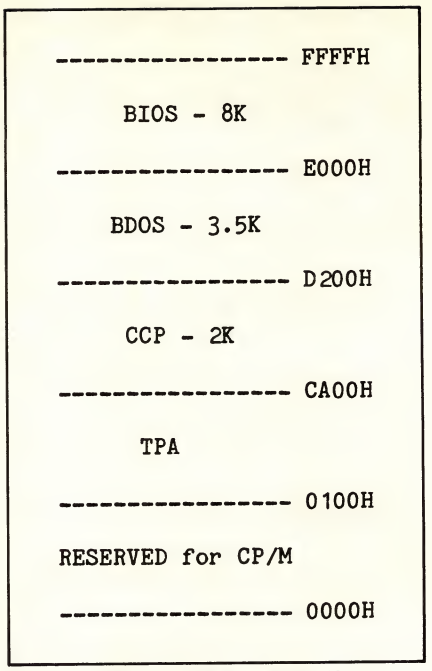

Figure 1. Where CP/M loads itself into memory. Note that the CCP is stuck between the BDOS and the TPA; therefore, any modification to the CCP must be made without increasing the size of the code.

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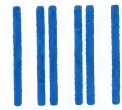

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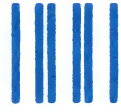

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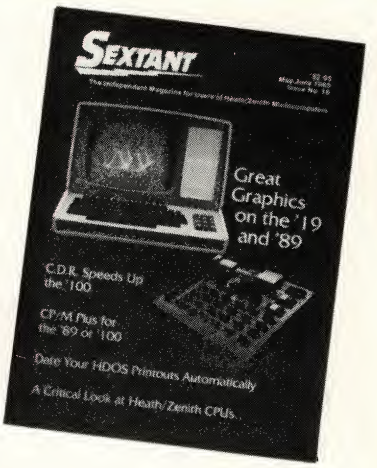
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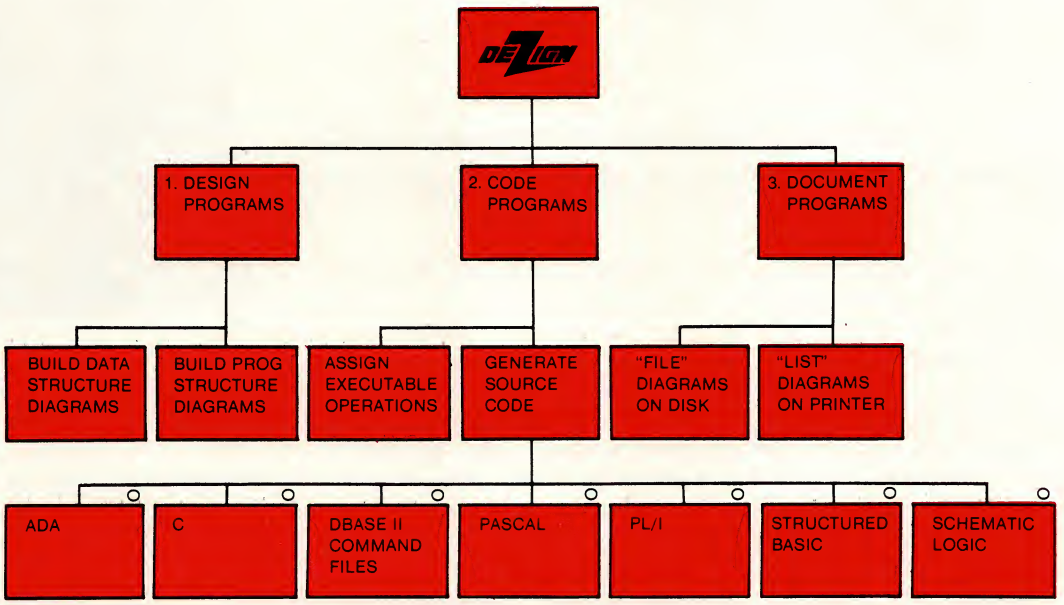

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```
Copy the following files to a bootable disk:

PIP.COM          <from the CP/M distribution disk
ED.COM           <from the CP/M distribution disk
DDT. COM         <from the CP/M distribution disk
SUBMIT.COM       <from the CP/M distribution disk
XSUB.COM         <from the CP/M distribution disk
MOVCPM17.COM     <from the CP/M distribution disk
MAKEZCPR.SUB     <from the vendors disk
ZCPRSUB.SUB      <from the vendors disk
ZCPR.LOC         <from the vendors disk
ZCPR.HEX         <from the vendors disk

                 <Then type:

A>SUBMIT MAKEZCPR 17

                 <After the A> prompt has returned, type:

A>MVZCPM17 * *   <run like MOVCPM17
```

Figure 2. The easy way to install ZCPR. After you type SUBMIT MAKEZCPR 17, a lot of disk gyrations will occur as the file is patched.

```
A>BDOSLOC   <run bdosloc.com to find the base address of the BDOS and CCP
THE BASE PAGE ADDRESS OF THIS SYSTEM'S BDOS IS D2 <BDOS = D200H
THE BASE PAGE ADDRESS OF THIS SYSTEM'S CCP IS CA <CCP = CA00H
```

Figure 3. Running BDOSLOC will produce two lines of output indicating the locations of the CCP and the BDOS. The CCP's location will be used in the steps shown in Figure 6.

```
A>SYSGEN
SYSGEN VER 2.2
SOURCE DRIVE NAME (OR RETURN TO SKIP)A       <drive a: is the source
SOURCE ON A, THEN TYPE RETURN                <type return
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) <reboot

A>SAVE 38 CPM64.COM   <save the sysgen image, 38 pages in this case
```

Figure 4. Following these steps will load CP/M into the TPA. SAVEing the image in the TPA will provide a file that can be examined to find the location of the CCP on disk. (See Figure 5.)

portant difference. The ZCPR version of TYPE has the option of paging its output.

TYPE FILENAME.EXT will scroll 24 lines of text to the console. Any key you type will cause another 24 lines to scroll. So there is no jumping for the control-S to stop the text from zipping past the screen. (You can also use TYPE FILENAME.EXT P to get a continuous scroll as before.)

The DFU command allows you to determine where ZCPR will look for a command if it is not resident to CP/M. Initially, the default user area is set to zero. User area zero will be searched for the command file on the current disk and disk A:. By specifying "DFU X", where X is a user area, ZCPR will search there instead of user area 0. However, each time a warm boot is performed the default user area returns to 0.

Installation—the easy way . . .

Installation of ZCPR can be performed in several ways. I will describe two of them—one more difficult than the other. You may have to use the more difficult depending on the type of system you are using—or depending on whether you want to learn a little more about CP/M and its utilities, such as DDT.

First, the easy way.

There is at least one vendor, Graph-Net Systems, Inc., which sells ZCPR in Heath disk format. Of course, the CHUG library disks are also in Heath format.

In both cases, a special SUBMIT file is provided to patch the MOVCPM17.COM file. The resulting file, MVZCPM.COM, contains ZCPR embedded in the system image.

All you need to do is run MVZCPM as you would MOVCPM17. The prompt will appear, asking you if you prefer ZCPR or the standard CCP in your system.

If you indicate you want ZCPR, the CCP is automatically overlayed. This is by far the simpler of the two methods—but not nearly as educational as the hard way.

Figure 2 indicates the steps required by this first method.

. . . and the hard way

ZCPR is usually provided in two forms: hex code and assembly language. If only the assembly version is available, you must assemble it to obtain the hex version.

If you know how to use DDT and SYSGEN, you can then overlay the ZCPR hex code over your existing CCP. The idea is to integrate the ZCPR.HEX file on top of the CCP in the image of CP/M that SYSGEN puts on disk. It is not as difficult as it might sound. The steps and commands needed for the whole process are shown in Figures 3-7.

Keep in mind the assembly version is in Z80 opcode. If you need to assemble ZCPR, you must use an appropriate Z80 assembler; do not use an assembler for 8080 opcodes, such as the one supplied with CP/M.

If the hex code is available, assembling is not a problem; but you will not be able to customize the source code without a Z80 assembler. And there is one value which is dependent upon your own particular configuration. This is the location of the CCP in memory. As we will see, it will have to be included in the hex version. Complete documentation of the installation procedures is included with the ZCPR package.

You must know two things about your particular configuration of CP/M. First, you need to know the location of the CCP in memory. And second, you need to find the location of the CCP on disk.

A program called BDOSLOC.COM (BDOS locator) is usually provided with ZCPR; BDOSLOC will provide the base address of the BDOS and CCP in memory. (See Figure 3.) This solves question one.

At this point, the address of the CCP provided by BDOSLOC can be entered into the ZCPR source code. Use an editor to enter it at the EQUate "CPRLOC". Then assemble ZCPR.ASM to obtain the hex file, ZCPR.HEX.

To find the answer to question two, we won't look at the disk. Instead, we will use DDT to look at the image of CP/M that SYSGEN leaves in the TPA. DDT can't load system files from disk; but the SYSGEN image will give us the information that we could find on disk. We'll use it to locate the CCP. (See Figure 4.)

First, call up SYSGEN and begin the process to SYSGEN a disk. But don't specify a destination drive. Hit RETURN

```
A>DDT CPM64.COM      <run ddt.com
DDT VERS 2.2
NEXT  PC
2700 0100
-D0980
0980 C3 5C D7 C3 58 D7 7F 08 43 4F 4E 46 49 47 55 42 .\..X...CONFIGUR
0990 00 20 20 20 20 20 20 20 43 4F 50 59 52 49 47 48 .       COPYRIGH
09A0 54 20 28 43 29 20 31 39 37 39 2C 20 44 49 47 49 T (C) 1979, DIGI
09B0 54 41 4C 20 52 45 53 45 41 52 43 48 20 20 00 00 TAL RESEARCH  ..
09C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
09D0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
09E0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
09F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ................
0A00 00 00 00 00 00 00 00 00 08 D4 00 00 5F 0E 02 C3 ............_...
0A10 05 00 C5 CD 8C D4 C1 C9 3E 0D CD 92 D4 3E 0A C3 ........>....>..
0A20 92 D4 3E 20 C3 92 D4 C5 CD 98 D4 E1 7E B7 C8 23 ..> ........~..#
0A30 E5 CD 8C D4 E1 C3 AC D4 0E 0D C3 05 00 5F 0E 0E ............_...
```

Figure 5. Use DDT to scan the image of CP/M created and saved in the steps indicated in Figure 4. Notice the two jump instructions (C3 53 CD C3) beginning at 0980H: they indicate the start of the CCP. (Not all the lines displayed by D0980 are shown here.)

```
A>DDT CPM64.COM  <run ddt.com
DDT VER 2.2
NEXT  PC
2700 0100
-H0980,DA00      <compute the offset from the CCP locations
E380,2F80        <result provided by ddt
-IZCPR.HEX       <input the ZCPR hex file control block
-R2F80           <read in the hex file
NEXT  PC
2700 0000
-^C              <exit ddt
```

Figure 6. DDT's H command will display the hexadecimal sum and difference of two hexadecimal numbers. The difference between 0980H (the start of the CCP, as in Figure 5) and DA00 (the start of the CCP provided by BDOSLOC, as in Figure 3) will be the offset given to the R command; this tells it where to read the ZCPR.HEX file into memory.

```
A>SYSGEN
SYSGEN VER 2.2
SOURCE DRIVE NAME (OR RETURN TO SKIP)          <use the memory image
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)B  <put it on b: disk
DESTINATION B, THEN TYPE RETURN
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)   <reboot

A>
```

Figure 7. SYSGEN your new disk, using the image of CP/M onto which the R command (indicated in Figure 6) has overlaid the ZCPR file.

instead to reboot. Then SAVE to disk the image in memory. Save the first 38 pages of memory under a suitable file name; I used "CPM64.COM" (just because I have a 64K system).

Next, use DDT to scan the image of that file until you find the CCP. The beginning of the CCP can be recognized by two jump instructions (C3 53 CD and C3 58 CD) immediately before a Digital Research copyright notice. (Figure 5 shows the important line of code.)

My CCP started at 0980H. It will usually start on an even page (i.e., 0900H, 0980H, 1000H, 1080H, etc.). As the process is given in Figure 5, I simply displayed 192 bytes of the file beginning at 0980H. You might want to take it slower. You could start your search at about 0900H and check from there.

Now you have the address of your CCP for both its normal location in memory and for the disk file you made after running SYSGEN. Now you have to read ZCPR into memory on top of where SYSGEN will look for the CCP when it produces a new system disk.

In case you're not familiar with DDT, I'll explain the procedure to integrate the ZCPR.HEX file into your SYSGEN image.

Three special DDT commands are required to overlay the CCP with ZCPR. (See Figure 6.)

The I command is used to give DDT the name of a file; it tells DDT that we intend to read that file into memory. In this case, use IZCPR.HEX to give the hex file to DDT.

The R command will get the file referenced by the I command and read it into a specific location in the memory image. (We must specify a location to R, else it will read the file into memory starting at location 0100H.)

So, we have to calculate the appropriate offset to give to R. In this case, the offset will be the hexadecimal difference between the address of the CCP in memory and what it was in the ZCPM64 file. We can find this with DDT's H command. (The description of H seems to be only in the documentation for CP/M-85; but it works in CP/M-80, too.)

The H command is used to display the hex sum and difference of two addresses. Use

H<ADDRESS1><ADDRESS2>

to compute the offset address. Here, ADDRESS1 is the location of the CCP in the image SYSGEN left in the TPA; and ADDRESS2 is the location provided by BDOSLOC.COM. The offset address is the difference between them. (H will give the sum first, the difference after it. See Figure 6.)

Now exit DDT and run SYSGEN, which will use the memory image as the source of your new system. (See Figure 7.)

Try it out

Now that you have ZCPR installed on your system, try some of the new commands and experiment with the old CP/M commands and see if you can tell the difference.

For example, ERA now shows you what was actually erased. The TYPE command will show one screenful at a time, or scroll continuously as before. SAVE will now save the memory image by page or sector, in decimal or hex. The DIR command is formatted slightly differently and can display the system files such as BIOS.SYS. After executing the USER command, the prompt will indicate the user area you selected.

One feature that is not so obvious, but very important, is the search hierarchy. (See Figure 8.) Earlier in the article, I described how the old CP/M CCP would search for a command in the resident-command list and the currently logged disk directory. Only two search levels were used. If the command was not found, an error message was returned.

In ZCPR, the first two levels are searched just as in the CCP. If the command is not found in the first two levels, ZCPR temporarily logs into the default user area and searches for the command. The default user area may be set with the DFU command available in ZCPR or with the DEFUSR equate in ZCPR.ASM at assembly time. If the command is not found, ZCPR will log onto disk A: and search the directory for the command.

When the command is found in any of the above cases, it is loaded into the TPA and executed. If it is not found, an error

message is returned. Finally, ZCPR resets the user to the original disk and user area. ZCPR, then, uses four levels of search hierarchy instead of two.

Remember the special case discussed earlier with a disk file named DIR.COM? With the standard CCP, it cannot be executed because the first level of searching will find DIR in the resident command list.

With ZCPR, you simply specify a disk before the command, such as B:DIR. ZCPR will log on to disk B:, execute the disk file DIR.COM, and return to the originally logged disk. So with ZCPR, you have the option of giving disk files the same name as the resident commands: SAVE, TYPE, DIR, REN, and ERA.

Another feature of ZCPR I appreciate is the opportunity to customize the source code to suit my own ideas.

For example, the familiar > prompt can be changed to suit your taste. The WIDTH equate can be changed to vary the width of the DIRectory display. The number of lines displayed by the TYPE command can be changed from the default 24 lines. There are about 20 easily changeable options.

And of course, if you're really ambitious, you can alter the source to develop your own resident commands.

There is more to ZCPR, but it is best covered in the documentation which accompanies the software. ZCPR is extremely well documented in both the source code and application notes. The documentation contains several examples and goes into great detail on customization and usage.

ZCPR and others

ZCPR is available in different formats from several sources. SIG/M volume 54 contains the entire ZCPR package on 8" IBM 3740 disks for a copying and disk fee.

CHUG volumes 104 and 105 contain the same package on 5¼" hard-sectored Heath format. They are available to members for $4 per disk and soft-sectored for $5 per disk plus $1 per disk postage. GraphNet Systems sells a similar package ready to run for about $25.

ZCPR is not the ultimate in CP/M command enhancements. Other much more sophisticated software is available to improve the command structure of CP/M.

And, if ZCPR is not good enough for you, you could try ZCPR2. This is an excellent program by the author of the original ZCPR. However, ZCPR2 is an extensive revision of ZCPR; and BIOS modification is required for full utilization. It is slightly more complicated to install but includes the benefits of ZCPR and much more.

ZCPR2 includes the capability of on-line documentation, multiple commands on one line, and a host of very

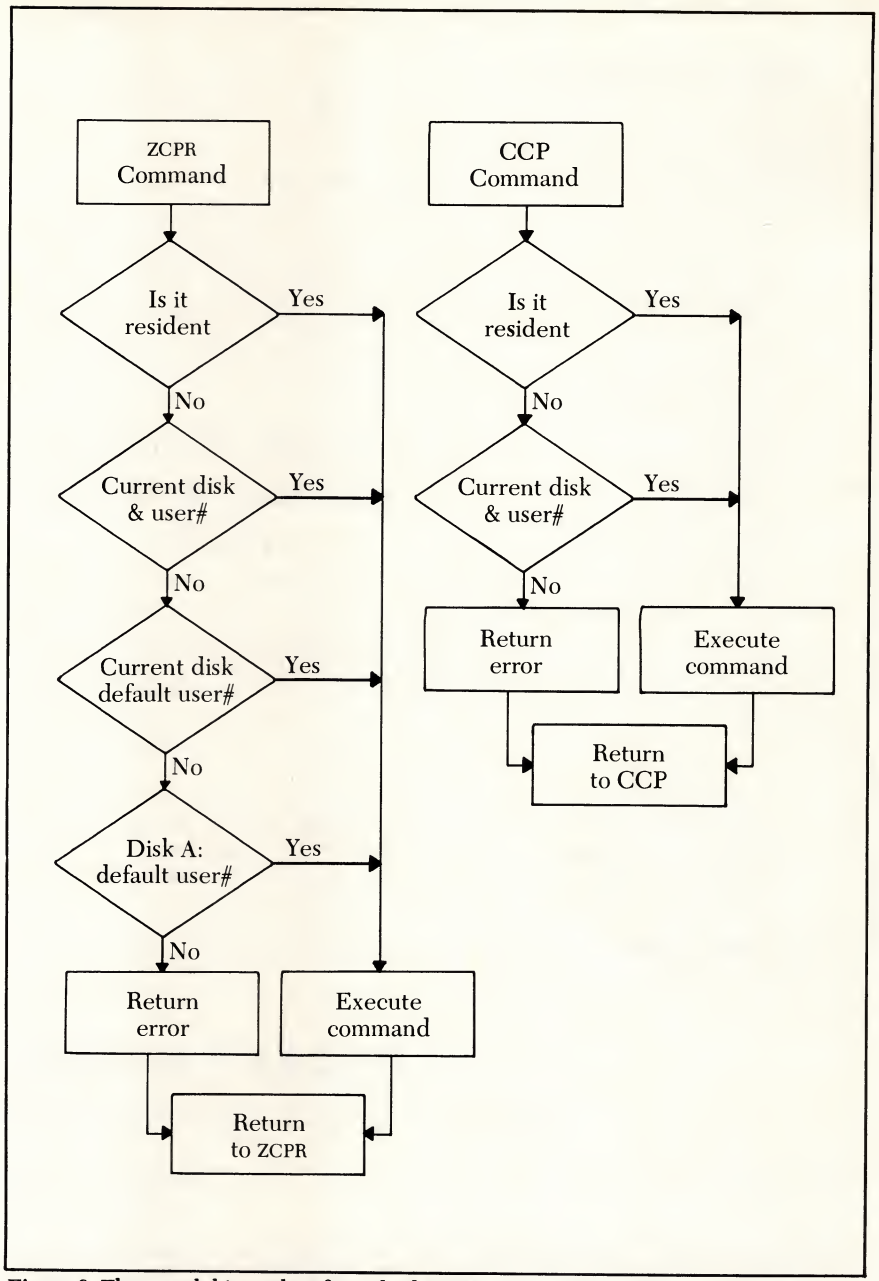

Figure 8. The search hierarchy of standard CP/M versus CP/M with ZCPR acting as its CCP.

	Command	Standard CCP	ZCPR Features
Standard CP/M commands	DIR	No SYS files	Display all files
	TYPE	Continuous scroll	Auto screen pagination
	REN		No change
	SAVE	Save by decimal	Decimal, hex, or by sector
	ERA	No display	Displays file names as erased
	USER	No display	Displays user #
Additional ZCPR commands	GO	N/A	Executes program in TPA
	JUMP	N/A	Go anywhere in memory
	GET	N/A	Load a file anywhere
	LIST	N/A	Send a file to LST: device
	DFU	N/A	Change the default user #
	RES	N/A	"RESET" system

Notes: N/A = Not available.
RES is not included with some ZCPR versions.

Figure 9. A comparison of command features of ZCPR and the standard CP/M CCP.

productive utilities. It is available from SIG/M on volumes 98-107. (That's right, ten disks!) You need a disk capacity of about 500K to fully utilize all the features of ZCPR2.

Buyer beware

There is one thing you should be aware of when dealing with public domain software—you don't get a guarantee with the product. ZCPR is a quality piece of software, however, and should set an example for others to follow.

However, I have three different versions of ZCPR. All three are from different sources and perform the same functions slightly differently. Some versions have a RES command to reset CP/M—the same as a control-C. One version has a CLS command to clear the screen.

This variety is not unusual when the source code is available for users to modify for their particular needs. But what you get may vary slightly from what I described in this article.

The suspense makes public domain stuff all the more interesting!

ERA now shows you what was actually erased.

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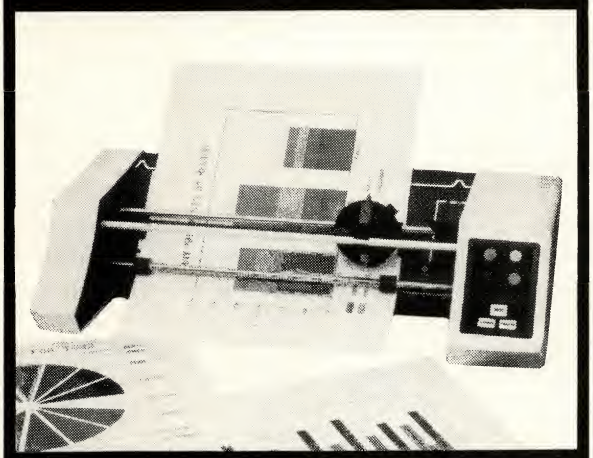

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The Z100 notebook continues to grow

About six months have passed since my Z100 arrived, and what a busy and exciting time it has been. There is so much to learn and do that I find myself jumping from one area of interest to another.

It has been several months since I have worked seriously with Z-BASIC. I have a large Z-BASIC address-maintenance program about 90% complete. I diligently tried to structure this program with subroutines for all functions that I called more than once. And I tried to use "top-down" logic—divide the whole into its parts, then deal with the parts. But as the program grew day by day, it became evident that the compulsory use of line numbers was a burdensome feature of Z-BASIC.

The program contained perhaps 30 subroutines. Even though I used a minimum number of GOTO statements, minor modifications caused a ripple effect all through the program and created a constant debugging situation. All variables in Z-BASIC are global; none are local. So a variable is available to all subroutines in a program. Great care must be exercised when changing the value of a variable in one subroutine lest it produce adverse effects elsewhere in the program.

I knew there had to be a better way to write a large program, so I looked at the Pascal and C languages for deliverance.

Several of my expert friends have convinced me that C is the way to go, so I have ordered a C compiler. You will be hearing about my C experiences in future columns.

While all of this is going on, I have instituted a determined effort to read every word in the 750-page manual that comes along with the Microsoft Disk Operating System (MS-DOS). Actually, I am making out quite well with MS-DOS. As it stands, I have already given it a great deal of study. But studying MS-DOS is like peeling an onion—there is always another layer.

I want so much to become more involved with computer communication, and I am doing preliminary work in this area. In this issue, I will share with you some of my discoveries relating to utilities, word processing, the MS-DOS operating system, modems, bulletin boards, and other items of interest. So, let's get going.

Large computer societies

I feel that *Sextant* readers know the important role that users' groups play in furthering the advancement of computer use. The Capital Heath Users' Group (CHUG) operates in the Washington, D.C., area. Because of its size and the dedication of its members, it has contributed much to our computer knowledge. CHUG has made available over 200 volumes of public domain software for $6 per disk or less.

The membership of CHUG exceeds 975, and a directory is published which shows the equipment owned by each member and the member's special interests. In addition to being an active member of the Tidewater Heath Users' Group, I also enjoy the privileges of being a member of CHUG and receiving their newsletter.

Then there is the new Capital PC Users' Group for the IBM Personal Computer and look-alikes. This group is not yet three years old and already has some 2,400 members; it is said to be growing at the rate of 100 members per month.

They publish a newsletter called the *Capital PC Monitor*. And they have a group-purchase club with annual purchases aggregating to $500,000. Think of what all this means to Z150 users.

Another large computer society is the Boston Computer Society (BCS), which is powerful and impressive. It boasts over 12,000 members and has formed some 40 special-interest groups (SIGs). The membership fee to join this society is $24 per year. It has a bi-monthly magazine called *Computer Update*. The BCS also maintains an information line; the telephone number is 617/227-0170.

MDISK.DVD and MEMBRAIN.COM RAM drives

MDISK.DVD and MEMBRAIN.COM are two of a number of RAM drives, or E-drives (emulated drives), as they are sometimes called. RAM drives are programs which interface the operating system with the computer's random-access memory (RAM). These programs allocate a section of RAM for use as an E-drive. Under MS-DOS, the E-drive functions very much like a floppy disk, except that it does not need formatting. (Under other operating systems, an E-drive may need formatting.) And, of course, it is volatile; if you lose power, you lose your data, too.

As I said, MDISK.DVD is a program. Actually, it is an executable file called a device driver: a program designed to interface the operating system to a peripheral.

The version of MDISK I first used is furnished on the MS-DOS distribution

disk. This device driver is limited in function since it cannot allocate any more than 64 kilobytes of RAM to a single drive.

This shortcoming seriously reduces its usefulness, and it is of little credit to Zenith or Microsoft to furnish such a device. Better they should have furnished a utility program that would allocate the amount of RAM drive memory needed, based on the user's determination.

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MDISK.DVD must have been an afterthought, anyway; for the word does not even appear in the index to the MS-DOS manual.

Heath/Zenith must have realized the minimal usefulness of the 64K version of MDISK.DVD, because they provided the source code for an enhanced version in the MS-DOS Programmers' Utility Package (Heath part #CB-5063-16).

This enhanced version must be assembled from the .ASM source code and then installed using CONFIG.SYS. Ralph W. Boyd details the procedure for installing a 128K, 256K, or 512K MDISK.DVD in *Buss* issue #101, January 17, 1985. We owe Boyd our appreciation for discovering and bringing to our attention this undocumented capability of MDISK.

To our good fortune, Dennis Lee has placed in the public domain a program called MEMBRAIN.EXE. My MEMBRAIN program was downloaded from the national Heath Users' Group bulletin board on CompuServe. HUG's MEMBRAIN seems to be just what the doctor ordered.

When it is executed, MEMBRAIN creates a device driver called MEMBRAIN.DVD. This device driver can be configured to your own specifications, unlike the MDISK.DVD supplied with the MS-DOS distribution disk. (You should note, though, that the version of MDISK supplied with the MS-DOS Programmers' Package *is* configurable to user specifications.) The MEMBRAIN documentation file explains how to set disk size, sector size, cluster size, and the like.

Upon execution, MEMBRAIN.EXE provides a display similar to this:

```
<<< M e m B r a i n >>>
(c) 1984 Dennis Lee
315 MemBrain Created
512 bytes per sector
1 sector per cluster
64 directory entries
1 reserved sector
2 FAT sectors
623 data sectors
-----------------
630 total sectors
```

MS-DOS's CONFIG.SYS file is a data file which should reside in your system disk's root directory. In order to use MEMBRAIN.DVD, you must edit the CONFIG.SYS file to include this line:

DEVICE=MEMBRAIN.DVD

Then make sure that the file MEMBRAIN.DVD appears in the root directory of the same bootable MS-DOS disk that contains the newly edited CONFIG.SYS file.

Reboot this disk and enter CHKDSK I: at the system prompt. The CHKDSK display should show the attributes of the newly created disk drive "I".

We all owe a debt of gratitude to Dennis Lee for this fine program and good documentation.

Before leaving this topic, though, I must point out that as good as MEMBRAIN is, it still has two undesirable characteristics.

First, it requires alteration of the CONFIG.SYS file, which is a slight nuisance in itself. (I discussed CONFIG.SYS in my column in *Sextant* #15, the March-April 1985 issue.) But more importantly, the RAM drive will become a part of the system each time the system is booted—whether you want it or not. To avoid this you have to alter CONFIG.SYS to remove the RAM drive device driver.

Second, in order to change the size of the RAM drive, you must create a new MEMBRAIN.DVD device driver by executing the MEMBRAIN command; and then you have to reboot so that the new device driver is recognized by the MS-DOS system.

There are, of course, commercial

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RAM drives which have eliminated these two undesirables. But they cost money; MEMBRAIN is free.

MEMBRAIN and the PeachText 5000 thesaurus

One of the bonus features of PeachText 5000 is the Random House Thesaurus. If the thesaurus is copied to the same working disk that contains the PeachText word processor, then it is available when PeachText is in the edit mode, and provides an easy method of locating synonyms.

The thesaurus contains approximately 4,400 indexed words which can be searched for while a document is being edited. The indexed words are related to 26,000 synonyms, all of which are present in a file occupying 118K on the disk. Let's look at an example showing how the thesaurus can best be used when it resides in a RAM drive.

Whenever I wish to do word processing, I create a 250K RAM drive in my Z100 using MEMBRAIN. Then I copy the PeachText word processer and the thesaurus to the RAM drive. Then when I type PT, the PeachText menu appears in an instant—because it is in RAM, it is displayed without a disk access. The edit and print programs load equally as fast.

PeachText does an awful lot of file juggling, and reads disks every chance it gets. The MEMBRAIN disk-drive emulator quickens PeachText's responses dramatically.

For an example of how the thesaurus is used, and how nicely the RAM drive works, you can just place the cursor on the first character of a word and press the F10 key.

For instance, choose the word "position." In the blink of an eye and with no disk access, the thesaurus will display across the bottom of the text screen the following synonyms: condition, situation, station, location, post, stance, viewpoint, predicament, and place.

Without even the bother of typing a word, you may replace the word "position" with any of the displayed synonyms. Just move the cursor to the word you select and hit the return key.

If you place the cursor on a word that does not appear in the thesaurus, it cannot return a synonym. But it will return two words which come closest to a spelling match. Thus, the thesaurus may be used in a limited way as an on-line speller.

One thing to be noted: the thesaurus only returns synonyms for root words, and not for plurals or words containing suffixes. Thus, to display synonyms from the thesaurus, you should delete the suffixes before making the search.

Borland's SideKick works on Z150s

Borland International's highly touted SideKick works on the Z150 PCs. I'm sure you have read the advertisements of how it maintains a calendar, a notebook, a table of ASCII equivalents, a phone directory, and a calculator in memory while other programs are running. All you have to do is strike a key to have SideKick temporarily overwrite the screen. You can then check a date, do a calculation, or make a note. Strike another key, and the program you were running is restored.

All of this seems so clever and handy; why is it that I get the feeling I'm watching a carnival magician when SideKick performs? Could it be that SideKick is but a high-priced substitute for a pad and pencil, or a phone number pasted on the wall?

You can't argue with success, though. Somebody likes SideKick, even if you have to pay $79.95 to get an unprotected copy. I am not too disturbed that SideKick does not work on the Z100. (As an aside, Borland International, which created Turbo Pascal and SideKick, has started a SIG on CompuServe. You can apply for membership by mail.)

AUTOEXEC.BAT and FNAME.BAT files

MS-DOS batch files save time by letting you type a few keystrokes to call up a whole series of MS-DOS commands. To set the stage for exploring the potential of batch files, a review is in order. (You might also want to take a look at Peter Norton's article in *Sextant* #10, May-June 1984, "Take Advantage of Z-DOS Batch Files.")

You may recall making batch files with CP/M-80's SUBMIT utility—the power for a good job just wasn't there. Then along came the Zenith Disk Operating System (Z-DOS). It was not a great deal better, since it had only two resident commands oriented toward batch-file processing; namely, REM and PAUSE.

Z-DOS, though, was just version 1 of MS-DOS. Finally, MS-DOS version 2 arrived with its assortment of resident commands; they've increased the versatility of batch files considerably and brought decision making into the batch process.

When I first decided to broach this topic, I thought to give it a quick overview and move on. But the more I looked, the more I saw. There is just too much substance relating to MS-DOS batch files to be dispensed with a lick and a promise.

The MS-DOS batch-file commands are: PAUSE, REM, IF, SET, SHIFT, FOR... IN... DO..., ECHO, and GOTO. The Microsoft technical manual devotes about 40 pages to batch files in general and to the batch commands in particular. Here, though, we can leave details to the manual and concern ourselves with an overview followed by useful examples.

A batch file is a text file created by an editor and assigned a .BAT extension. A batch file consists of a series of commands to be executed in succession by the operating system. Both Z-DOS and MS-DOS support AUTOEXEC.BAT and FNAME.BAT batch-file processing. (The word FNAME is understood to be any legal file name of the user's selection.)

The file bearing the reserved name AUTOEXEC.BAT is executed automatically from within the operating system upon bootup. Because it is always executed automatically upon bootup, flexibility is lost. Only one AUTOEXEC.BAT file can appear on a disk, and this file must appear in the root directory.

AUTOEXEC.BAT files are best utilized either on disks dedicated to a particular task, or on disks needing routine commands for setting paths or loading utilities.

FNAME.BAT files are batch files which can be executed, at will, from the operating system's command line. You may create as many FNAME.BAT files as needed.

Of course, each FNAME.BAT file serves a particular purpose, and thus provides greater flexibility than the AUTOEXEC.BAT file. Later, we will look closely at an example of a batch file named PT.BAT.

MS-DOS manual criticized and defended

A while back, Henry Fale, the editor of *H-Scoop*, wrote: "As for the new MS-DOS manual, if I did not know better, I'd say the folks at DR wrote the manual, since it's confusing and as hard to understand...." (See *H-Scoop* #56, November 1984.)

Anyone who has suffered through the early versions of Digital Research's CP/M-80 manual knows that comparing a technical manual with one of theirs is about as nasty a thing as one could say. Mr. Fale's general denigration of the MS-DOS manual is the first severe complaint that I have heard, and in the inter-

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Especially helpful are the folks we have worked with to develop print drivers for their particular printer. We obviously cannot have every dot-matrix printer available for testing. Through our correspondence, these people have helped us implement more standard print drivers for DOODLER.

Many times, customer support and loyalty is the key to a program's success. We believe this is the case with DOODLER. Thanks!

Suggestions and Ideas for using the DOODLER Graphics Package . . .

Here are some ideas for you to try out with your DOODLER program. Many features of DOODLER are probably overlooked by users because they haven't thought of an application for them. Here are some tricks which we have learned through our extensive use of the program.

1. Simple animation can be done with DOODLER by using the following procedure. Draw the object which you want to animate. Make a frame around it. (smaller the better). Move the cursor a few pixels and MOVE the frame to this new location. Repeat this process until the object arrives at its destination. Now PLAYBACK the picture and watch it move.
2. If you're not sure about the exact location when moving a frame, COPY the frame to the new location using the XOR function. If you missed your mark, you can just COPY using the XOR again and the copied image will disappear. When you get the position right, MOVE the frame.
3. Create a custom font containing symbols used for a special application. Examples would be schematic symbols or musical notation. Be sure to set the 'Left Space' and 'Right Space' amounts so that all characters will be multiples of the same width. This makes screen entry easier.
4. If you do many designs which are similar, try making a template picture containing all common features. Then you won't have to redraw each design from scratch.
5. Due to DOODLER's variable width and proportionally spaced character fonts which display text non-destructively over the background, the BACK SPACE key cannot be used to erase the last character. The BACK SPACE key DOES have an undocumented use, however. Whenever you press the BACK SPACE key during the course of drawing with DOODLER, a one second pause is inserted when in PLAYBACK mode. This is helpful when making up a slide show for PLAYBACK.

DOODLER is available at Heath/Zenith Centers Nationwide

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est of fair play, I cannot let it go unanswered.

On the whole, I find excellent user coverage of MS-DOS given in Volumes 1 and 2 from Heath/Zenith. MS-DOS is a sophisticated operating system which cannot be explained without extensive coverage. In my opinion, Heath/Zenith and Microsoft have given us some 750 pages of carefully prepared and clearly written documentation.

The table of contents alone, which occupies 37 pages, speaks to the detail of coverage. The 27-page index is another good indicator of the care which went into the manual's preparation.

I have given the greater part of the MS-DOS manual a careful reading and have found it to be clear and detailed. There are over 50 MS-DOS commands to be learned, and this does take time and effort. Power comes from learning these commands well, and the manual contains 344 pages devoted to explaining the primary commands.

Then there is Volume 2 of the technical manual which explains EDLIN, LIB, LINK, and DEBUG in detail.

If all of this coverage does not satisfy your yearn to learn, you may buy the Programmer's Utility Pack, which contains another 750-page programmers' manual. This manual continues where the MS-DOS users' manual leaves off, and together they provide extensive support.

```
ECHO OFF
CLS
PATH C:\BIN;C:\PT;A:\;B:\
VERIFY ON
PSC
CD\PT
I:
COPY C:*.*
CLS
SD
ECHO
ECHO  RAMDRIVE I: NOW CONTAINS 'PT' WORD PROCESSOR AND THESAURUS.
ECHO
ECHO  DO NOT SAVE FILES TO THE RAMDRIVE, USE "X=B:FILENAME.EXT"
ECHO  TO SAVE FIRST TO DRIVE B: THEN END ON DRIVE A:
ECHO
ECHO  TYPE 'PT' WHEN YOU WISH TO START WORD PROCESSING
```

Listing 1. Under MS-DOS version 2, WP.BAT will clear the screen, set multiple hierarchical paths, turn verification on for COPYing, load the PSC screen-dump utility, change the directory of the C: drive to the PeachText directory, load the RAM disk (I:), copy all files from C: to I:, and display the resultant directory with the SuperDirectory utility.

Teaming PeachText with MEMBRAIN and .BAT files

As discussed above, PeachText performs at its best when loaded into a RAM drive. We also discussed how to obtain and use the public domain MEMBRAIN program to create a RAM drive. It now remains to find a quick and easy way to load the PeachText word processor into the RAM drive, and to create an environment to make word processing easier.

WP.BAT was created to fill this need. You can see it in Listing 1. I keep this file in the root directory of the C drive so that it will be immediately available upon bootup. I don't have to execute WP.BAT if I have some task other than word processing in mind.

With WP.BAT on disk, I simply type WP. WP.BAT then clears the screen, sets the multiple hierarchical paths, and sets the resident VERIFY command ON. (VERIFY ON will ensure that files have been written to disk correctly—without my needing to include the /V switch in the COPY command.) WP.BAT also loads the Print Screen program (PSC). (I like to have PSC resident in high memory so that I can dump a screen display to the printer at will.)

In Listing 1, note the command CD\PT, which changes the directory of

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the C drive to the PT subdirectory, where the PeachText files reside. This is followed by the command that logs in the I drive (the RAM drive). Then the copy command with the wildcard specification copies all the PeachText files from drive C to the RAM drive I.

The SuperDirectory program (SD) is executed to display the I drive directory, and to show the remaining space available in the I drive.

Finally, the ECHO instructions instruct the user on how to avoid a "disk full" situation on the I drive, in the event that files accumulate in excess of the space available.

WP.BAT is a rather trivial example of a batch file that serves its purpose well. It does not begin to use the power available in MS-DOS for batch processing. There are no loops, no labels, no conditional statements, no PAUSEs, and no FOR... IN... DO... structures.

In future columns, I hope to give useful examples of more complex batch files. If you have a clever batch-file creation, I welcome hearing from you.

MS-DOS hierarchical directories and paths

Hi er ar' chi cal (five syllables) directories have grown on me. At first I was dubious about the need for, or the desirability of using, hierarchical directories, but now I like them. Microsoft has provided version 2 of MS-DOS with the power to establish as many directories as needed on a single disk. Each directory may have one or more child directories, thus forming a family tree.

Directories are related to one another by paths, which are typed in by the user as an argument to the resident PATH command. MS-DOS also has other resident commands that enable the user to make directories, change them, and remove them. Directory management is well covered in the MS-DOS technical manual.

While hierarchical directories can be used on 5¼" disks, I find them of greater value on 8" disks—where the need exists to organize the larger number of directory entries. For those of you who are still working with Z-DOS, the Heath Disk Operating System, or the CP/M operating system, you have a treat in store when you move up to MS-DOS version 2 and can use its hierarchical directory system.

With hierarchical directories, you may place all of your letters in one directory, all of your articles in another, your binary files in a third, your DOC files in a fourth, and so on.

At first, I experienced some trouble in remembering where I was in the hierarchical tree and in manipulating and maintaining files. I was not alone. I have seen MS-DOS users with several weeks' experience still fumbling about to set di rectory paths, or to copy files from one directory to another. It is all easy now.

You may set up the path commands when you first boot up, and you should use multiple paths. Contrary to what some think, the paths are not limited to one drive.

If you like, you may have AUTOEXEC.BAT set the paths for you, change the screen color, load PSC, and set the clock (SCRNCLK.COM). Once the paths are set, I seldom find it necessary to change them thereafter, though I do change directories from time to time. Changing directories is far easier than changing disks.

Hierarchical files are well suited for use with three or more disk drives. You can let all of your programs reside on one bootable system disk in the 8" drive, and use the 5¼" drives with nonbootable data disks. With this arrangement, the data disks will each store over 360,000 bytes, and that will keep you typing for a while.

There are tradeoffs associated with hierarchical directories. File access may be slower; but speed can be improved by looking ahead and making all of your directories when the disk is freshly formatted. That puts them all together and at the beginning of the disk.

If you are a PeachText user, or for that matter a user of any of the vintage programs written before the advent of hierarchical directories, you may be frustrated by the inability to access more than one directory from within your program. To use the PeachText word processor with data disks containing hierarchical files, first log onto each drive containing the data disks, and then change directories to the desired directory. Then, and only then, log onto the PeachText program disk and call it up.

I have not yet found the need for subdirectories within subdirectories.

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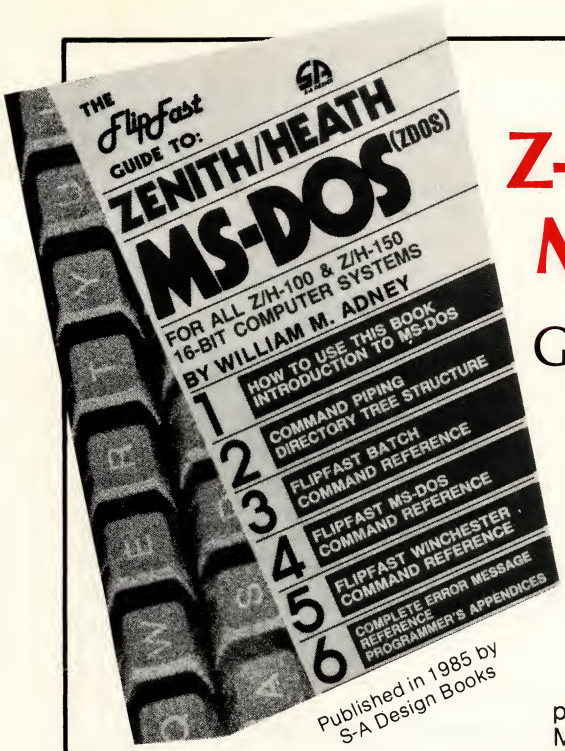
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2 COMMAND PIPING DIRECTORY TREE STRUCTURE
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4 FLIPFAST MS-DOS COMMAND REFERENCE
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This form of cascading directories complicates the directory structure and the path commands, slows down disk access, and should be avoided unless there is some compelling need.

Reading *Sextant*

The premiere issue of *Sextant* was published in the spring of 1982. Since then, *Sextant* has opened many doors for me, with its informed coverage of the entire Zenith computer community. Originally, there were four issues annually; now there are six. I would like to see *Sextant* published even more frequently because of the ever-increasing audience, and because computer developments are occurring at such a rapid rate.

I say all of this because of the enjoyment I have received in reading each issue, since the very first one. It was the September-October 1984 issue of *Sextant* that spurred me to start on the road to MicroNET and to the HUG Bulletin Board (BB) and Special Interest Group (SIG). (See Frederick Zimmerman's "Communing by Computer" and "Z-DOS Communications Roundup.")

I'd like to provide some background and then chronicle the first steps I took as I learned to access the HUG BB and SIG via CompuServe.

Modem considerations

To communicate with a bulletin board, you must have a telephone and a modem. The term "modem" is ambiguous, if taken out of context. The software to control computer communication is sometimes called a modem package; but the word really refers just to a hardware device.

In the hardware sense, the modem is a receiver and transmitter, with a carrier for sending and another carrier for receiving. The sending carrier is modulated with the data bits being sent. The receiving carrier must be demodulated to recover the bits to digital form. Hence MODulate–DEModulate gives us the word "modem."

In June of 1982, I purchased my first modem. It was a battery-powered affair that performed poorly. I would suggest that you steer clear of battery-powered modems. I quickly returned this modem to the Heathkit store and applied my refund to the purchase of a Universal 103 O/A LP modem; its Heath model number is WH33. And it sold for $195, which placed it in the middle price range.

The WH33 has proven to be an excellent modem. It is a direct-connect modem; these offer better data-transfer quality than acoustic modems, where the telephone just rests in a microphone/speaker cradle.

Also, the WH33 derives all its power from the telephone line and does not require a battery. I much prefer a direct-connect modem over an acoustic-coupled modem, and I consider it worth the extra cost.

The WH33 provides full duplex communication at 300 bits per second. Full duplex means that it is capable of simultaneously sending and receiving serial digital data over a dial-up telephone line. It has an RS-232C serial interface which is standard in the H/Z89 and Z100 computers.

The WH33 has a manual Originate/Answer switch and a manual Talk/Data switch. If I originate a call, I switch to Originate before calling; and when receiving a call, I switch to Answer. Also, when I am ready to receive data over the phone line, I switch from Voice to Data. The manual switching presents no problem whatsoever.

MODEM7 and ACCESS programs

There are a number of good modem programs. For CP/M users, there is the ever-popular public domain MODEM7 with its many versions. If you cannot get a copy of the MODEM7 program from a local source, then it may be ordered from Elliam Associates, a commercial concern which specializes in distributing CP/M Users' Group (CPMUG) disks. The older version of MODEM7 will not function properly on the Z100. There is, however, a MDM7 program on the NARDAC bulletin board at Norfolk, Virginia. (The commercial phone lines to NARDAC's board are 804/445-1121 and 804/445-1627.)

For MS-DOS users, the commercial ACCESS program has become popular among my associates. ACCESS is a communications program developed by Hilgraeve, Inc. The advertised price is $49.95 for the H/Z89 CP/M version and $59.95 for H/Z100 (Z-DOS, CP/M-85, or CP/M-86) versions.

ACCESS is sold in many of the Heath/Zenith stores. It may be used with dumb or smart modems. (Smart modems allow you to type the phone number from the

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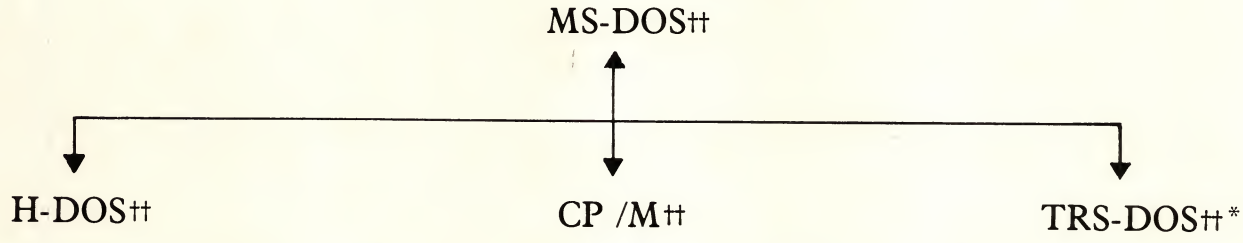

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Circle #210 on Reader Service Card

keyboard—and lots of other smart things.)

The ACCESS program is both simple and sophisticated at the same time. It is menu driven, and allows transfer of any type of file using an error-correcting protocol. It is compatible with the XMODEM handshaking protocol. At a deeper level, ACCESS contains its own language that allows self-executing scripts.

The Z-DOS/MS-DOS version may be used to access CP/M bulletin boards and download files from them. Obviously, if you download a CP/M .COM file to a Z-DOS/MS-DOS disk, it will not run and should be read to a CP/M disk. This can be accomplished using RDDOS.CMD, a program furnished on the CP/M-86 distribution disk.

HUG Bulletin Board Handbook

I just purchased my *HUG Bulletin Board Handbook* from the Heath/Zenith store for $5. The handbook also may be ordered from Heath/Zenith by mail, using part number 885-4700.

The handbook is a 28-page document intended to give a helping hand to the new user of the HUG Bulletin Board—the HUG Special Interest Group on CompuServe. It can be used as a supplement to the CompuServe documentation or as a stand-alone tutorial.

The handbook primarily consists of eight files, copied from the HUG bulletin board. If this book is read and understood before the initial sign-on to the bulletin board, a great deal of time may be saved. Each of the eight files is listed below with a two-character menu-selection code.

MI – New Member Information
X0 – Important Commands (includes this list)
X1 – How to Find Files
X2 – How to Download Files
X3 – How to Upload Files
X4 – How to Use the Message Base
X5 – How to Set your Parameters
X6 – HUG BBS List

In addition to the references above, there are three important commands which are not included in the handbook. They are: I – General SIG Instructions; CO – Conference Instructions; and B – HUG Bulletins.

The HUG SIG and the HUG bulletin board may be accessed using CompuServe for $6.25 per hour at 300 baud during off-peak hours. (Prime/daytime hours are between 8:00 a.m. and 6:00 p.m., Monday through Friday.) HUG members are allowed a 50-cent per hour discount when connected to HUG SIG. The SYSten OPerator can be contacted at the HUG office, 616/983-3463.

Gift certificates show heart

Things are not always what they seem. I ordered my Z100 through the Government Employees Association (GEA). Under their agreement with Zenith Data Systems (ZDS), GEA members can get Z100s, etc., at the same price the government pays. (GEA is open to federal employees including military and reserves.)

When I sent in my order back in March of 1984, I expected to have my dreams realized within the month. What a buy! The low-profile Z110 computer with a color monitor and 448 kilobytes of memory, together with the Zenith Disk Operating System (Z-DOS), CP/M-85, Z-BASIC, PeachText, and the BASIC compiler—all for $2,804.50 delivered!

Then the delays and long wait began—weary weeks and months of frustrated anticipation. But, finally, on August 17, 1984, the shipment was made.

I'll never quite recover from the time lost and the utter frustration I suffered, but I must say that ZDS does have a heart and a sense of fair play. After being essentially ignored for five long months, I received a letter expressing their regret for the "inconvenience" they had caused; and they offered the options of immediately supplying a Z150 or the delayed delivery of the Z100 coupled with gift certificates worth $350. I chose to wait for the Z100 because it would support my H89 software.

Do you know of any other company which would voluntarily give you $350? Although I thank ZDS for the gift certificates, in the future I'll be more careful about putting money up front for any purchase.

PeachText recognition characters

Have you noticed that PeachText's word processor uses command-recognition characters, such as ">" and "<"? The > and the < are used to mark characters to be printed as superscripts or subscripts. You may have noticed that when you incorporate these characters

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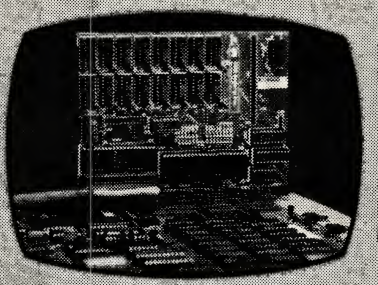

Board 1 has two banks of 256k chips possible for a total of 512k. Either or both banks are able to use 64k chips instead. Board 1 can be used by itself, with board 2 added at a later date.

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Board 1 includes hardware manual and ram drive software with no ram: $190.00. Each 256k bank, add $90.00. Board 2 (must have board 1). With no ram, no clock, no SASI $90.00. Each 256k bank, add $90.00. Ask about clock, SASI pricing.

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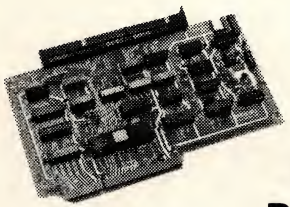

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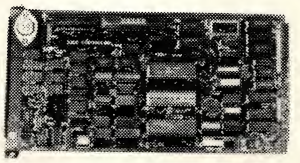

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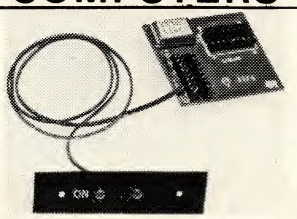

The ZS100 runs the Z100 CPU 50% faster, (7.5 MHZ) in 8088 mode. The ZS100 installs easily with no soldering. The ZS100 is externally switchable between speed mode and normal. The ZS100 improves the time performance of applications packages with no software modifications needed. The ZS100 is for all Heath/Zenith 100, 110 and 120 series computers.

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into your text, they do not print.

So how do you print them when you need them? The PeachText manuals tell you how; see "Recognition characters" in the index.

Any recognition character may be disabled by embedding a command in the file. In order to print both the > and the <, you may embed the text-formatting command \SSA, \SSB in the file prior to where you wish to print the characters.

An alternative way of allowing the > and < characters to be printed is to assign some other recognition characters to superscripts and subscripts. This can be done by embedding \SSAx, \SSBy in the text. Here, x and y are characters of your choosing.

PATH=C:\BIN;C:\DEVEL

This command sets up a dual search path to access hierarchical directories under version 2 of the Microsoft Disk Operating System (MS-DOS—or simply DOS). The semicolon separates the two paths.

Here is an example of how DOS reacts to the sample command given above. If drive A is logged in and you type ZBASIC, DOS will search drive A: for ZBASIC. If it is not found on drive A, then DOS will search for it according to your path command, first in the BIN directory of drive C:. If ZBASIC is not found there, then the DEVEL directory on drive C will be searched.

A path command can be issued from any logged drive. Many paths may be included in the command; but it takes more time for DOS to search all the way to the end of a long path command; so take care to place the most-used paths first. It is only necessary to type the path command once during a session, unless a change in the path is desired.

Even though the dual path command is helpful, it does not accommodate those programs like PeachText which ignore the path command; they can only read and write to the directory that was active prior to their execution.

While you are in Z-BASIC, a SAVE command will store your current program in a file on the current drive, unless you specify some other drive in the SAVE command.

Disk-drive step rates

Are you using the optimum step rate for your disk drives? If you are working under Z-DOS, there is a chance that you are not. I know that I have experienced occasions when, for some unexplained reason, the step rates of my drives became too slow. At least they seemed slower and were making more noise than normal.

The CONFIGUR program I received on the distribution disk of Z-DOS version 1.25 does not provide for setting disk-drive step rates. And it seems to me that when Zenith omitted the set-step-rate provision from the Z-DOS CONFIGUR program, they made a mistake. CP/M-80's CONFIGUR program for the H/Z89 allowed users to set drive step rates. This feature is missing from the Z-DOS CONFIGUR program, but MS-DOS version 2.13 does allow for setting disk step rates.

I have been advised by "the experts" that it is best to set 5¼" drives at 6 milliseconds, and to set 8" drives for 3 ms. My drives are set to these values and they run much more quietly than before. I have encountered no operation problems with these settings.

For the intrepid, there is a procedure in Appendix Q of Volume 2 of the Z-DOS manual, which gives step-by-step instructions for modifying Z-DOS's basic input/output system (BIOS) with DEBUG to alter the step rate on 8" drives.

Using PSC and OFFLINE together

Have you ever wanted to write a quick note without finding a disk and loading an editor?

I would suggest keeping the file OFFLINE.COM on your systems disk together with PSC.COM, the screen dump I described in issue #15 (March-April 1985). You will find the PSC.ASM file on the Z-DOS distribution disk, and of course it must be assembled before it can be used. The assembled program, PSC.COM, appears on the MS-DOS 2.0 distribution disk.

Execute PSC from the DOS command prompt and the PSC program will be placed into memory and remain there until a reboot occurs.

You may then execute OFFLINE whenever you desire to set the terminal color, cursor, key click, or what have you. In addition, you may type ordinary text, and use the terminal backspace key to make corrections as you go.

The beauty of using this technique is that when you are offline you may treat the display very much as if it were a full-screen editor, and use the arrow keys to skip about to make text corrections. When finished, press the HELP key to come back on line. After doing this, you can get PSC to send the entire screen display to the printer by pressing the SHIFT-F12 key.

Additional Information

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Circle #133 on Reader Service Card

Add Automatic Key Repeat to Your '89 or '19

This simple circuit takes only a few hours and under $3 to build.

Ray Albrektson

My venerable H89 seems to improve with age—thanks to the many upgrades that have become available for it over the years. Its latest modification corrects one of the less desirable features of the H/Z89 (and its terminal cousin, the H/Z19).

In the stock version, it is necessary to hold down the Repeat key in order to enable continuous repeating of a selected key. Most newer computers and terminals are designed so that holding down any key for a short period of time sends the key into auto-repeat mode. All Heath computers since the H/Z100 series have had this feature; and I wondered how difficult it would be to modify my '89 to do the same thing. Of course, I could have purchased an add-on board to give me auto-repeat. (Boards are available from Analytical Products of Woodlake, California, and B-G Technology of Rochester, New York.) But I preferred to do the job myself.

It turned out to be remarkably easy, taking less than an afternoon and costing a little less than $3. The reason why the modification is so easy lies in the way the '89 keyboard works. If you don't care

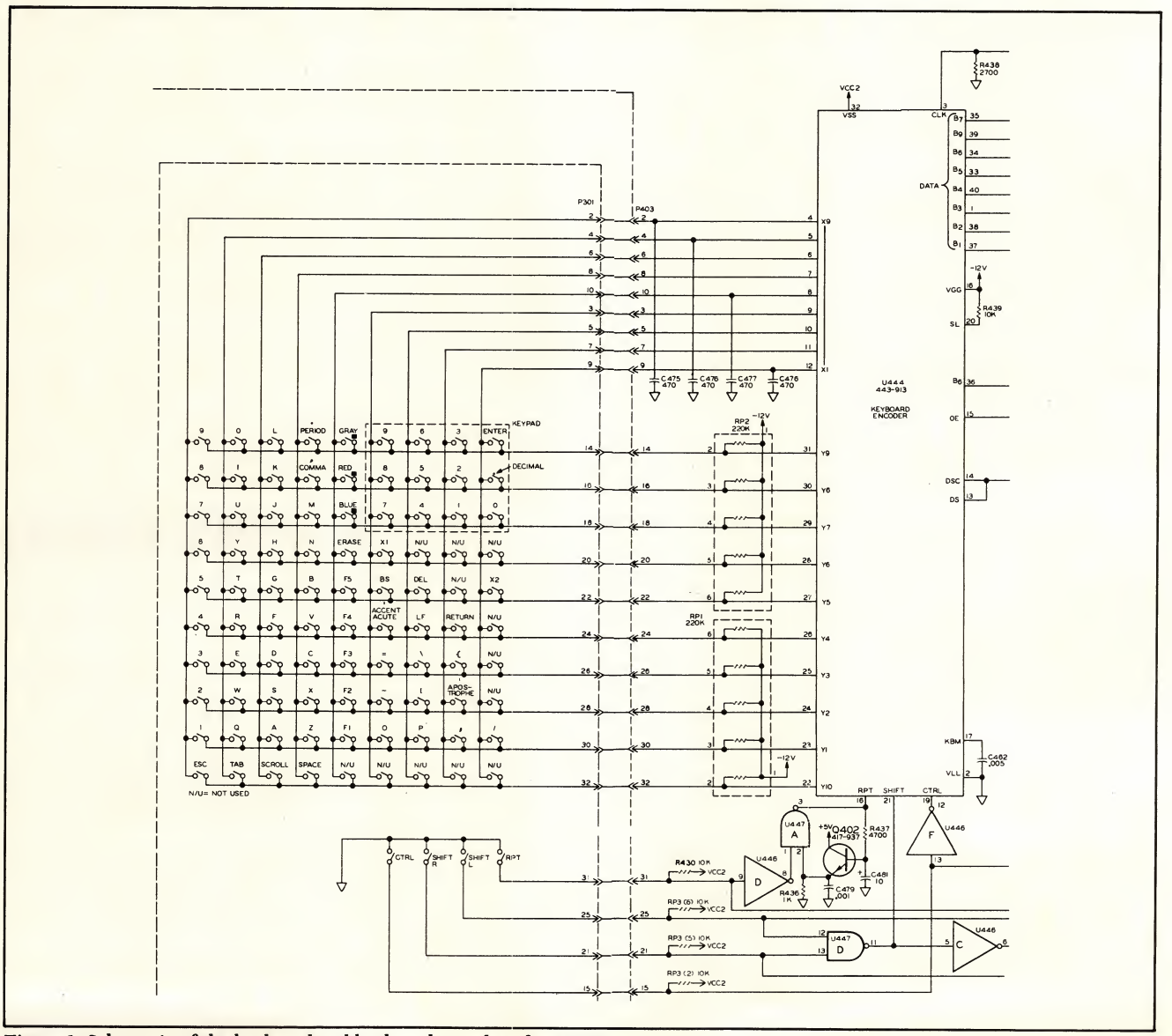

Figure 1. Schematic of the keyboard and keyboard encoder of an H/Z89.

about the technical details, then just skip ahead to the "how to do it" section. (Of course, if your modification doesn't work, you'll have to troubleshoot. And to troubleshoot, you'll just have to read this part, anyway. So why not save time in the long run and read it now?)

Inside the keyboard-controller chip

The printed-circuit board for the keyboard on the '89 (and '19) has no "real" circuitry on it at all. The board has only a maze of printed-circuit traces connecting the key-switches. You have to go to the terminal circuit board to get the electronics that scans all those switches and determines which ones have been pressed. On the terminal board, U431 is the keyboard-encoder chip. (See schematic in Figure 1; the encoder chip on your '89 may be designated U444 instead of U431.) U431 single-handedly (almost) figures out which key was pressed; then it puts the corresponding ASCII code on the terminal's data bus.

The '89 has 78 key switches that can be activated by pressing individual keys. As you can see in Figure 1, these switches are arranged in a nine-by-ten matrix (with 12 switches unused).

The keyboard controller uses only 19 of its 40 pins to sense whether or not any of the '89's keys are pressed. It uses a "matrix-scanning" technique to avoid having to sample all 78 of those keys every couple of milliseconds. So the keyboard controller can detect a pressed key in any given vertical row by a simple two-step process.

First, the controller brings one of the "X" lines positive—we'll say X6, for example. The controller's internal circuitry then samples all of the "Y" lines to see if any of them are high. If a Y-line is high, then the controller knows that a key must be pressed; it can figure out which one was pressed by the X-Y location. For example, if Y3 is high while X6 is high, then the key for "D" must be down.

The keyboard controller detects key-closures in this way; but how does it know if it is upper- or lowercase?

It still needs more information to finish its job. The additional information (such as whether or not the Control, Repeat, or Shift keys are down) comes from other keys that are not in the scanned matrix. Additional circuitry is used to make the signals from those keys understandable to the controller. (This circuitry can be see in Figure 1, directly under the keyboard controller chip.)

D1-D11	Small-signal diodes: 1N914, 1N34 or equivalent
U1	4011 Quad NAND gate
C1	22-picofarad ceramic capacitor
C2	10-microfarad electrolytic capacitor, 10 working volts or more
R1	500-kilohm miniature potentiometer
Miscellaneous:	
	two-conductor wire for power (2")
	14-pin IC socket
	2-lug terminal strip
	1" × 2" perf-board

Table 1. Parts list for the auto-repeat board.

Inside the automatic key repeat

The principle on which the auto-key-repeat device is based is this: the auto-key repeater samples all of the Y-lines to detect any key closures. When a key-closure is detected, it waits for a certain period of time. (I set it at about a second.) If the key is still pressed at the end of that time, the auto-repeater will electronically close the repeat key.

All this with *one* chip?

The circuit of the auto-key repeater is shown in Figure 2. The heart of the device is U1; it is a CMOS integrated circuit, a 4011 quad NAND gate. (A NAND gate's output is positive unless both its inputs are positive.) I use three of the four gates available.

Other components include two capacitors and 11 diodes. And there's a potentiometer whose variable resistance controls the amount of delay before repeating begins; you can set it according to your own preference. (See Table 1 for the parts list.)

Ten of the 11 diodes are wired to the keyboard circuit board itself. These ten diodes are connected to the Y1-Y10 inputs of the keyboard controller; but they are actually soldered to P301 on the keyboard circuit board. They act as a giant OR gate; so if any of the Y-lines goes positive, then the output is positive and C1 on the auto-key-repeat board becomes charged.

The first two NAND gates (U1a and U1b) each have their inputs tied together. So they are used simply as two inverters in series with each other. Therefore, the output of U1b goes high when positive pulses begin to appear at any of the Y-lines providing input to U1a. Since gates are either on or off, using them has the effect of squaring up the signal.

The variable resistor R1 and capacitor C2 determine the timing delay before

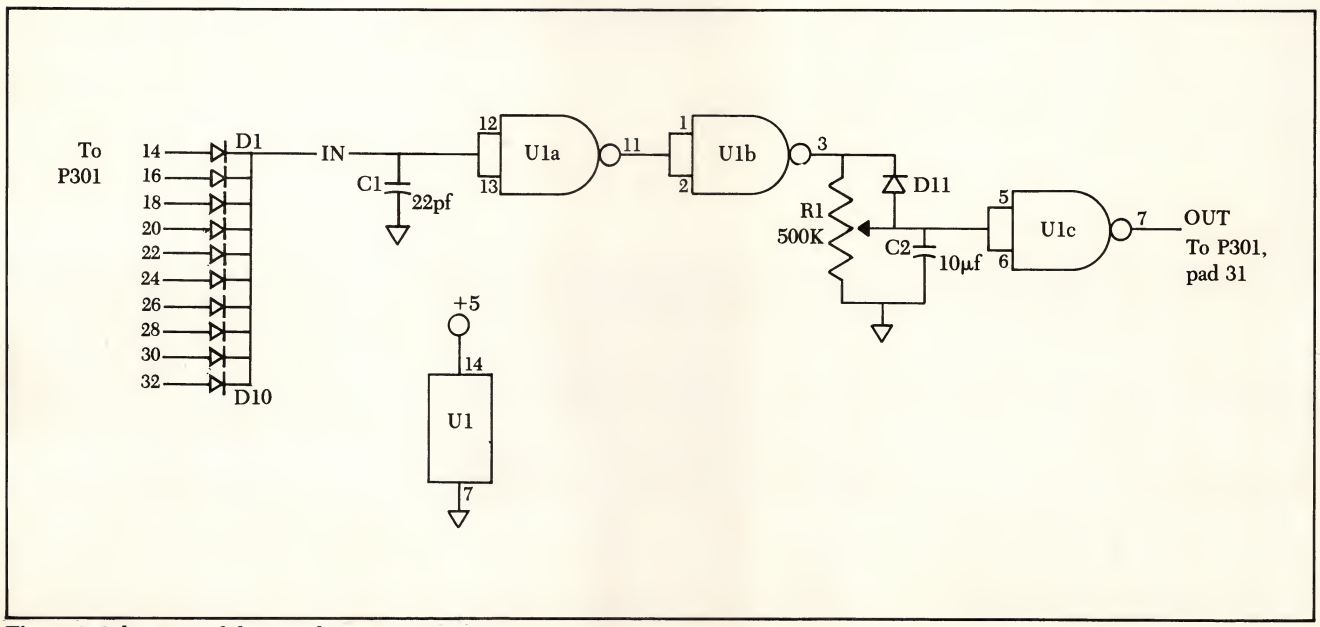

Figure 2. Schematic of the auto-key-repeat circuit.

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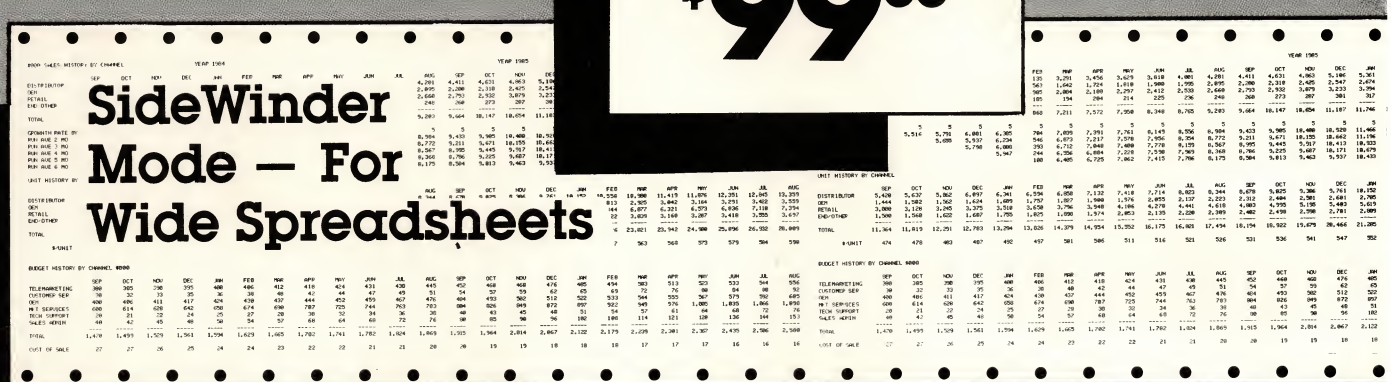

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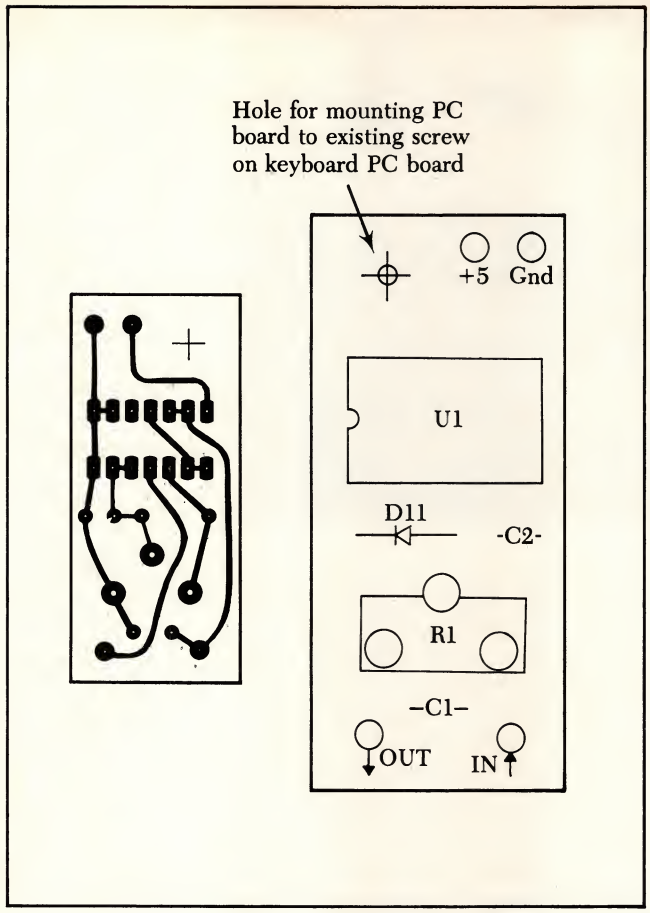

Figure 3. On the left, camera-ready artwork for the foil side of the printed-circuit board. Component layout is shown on the right. The component layout has been enlarged for readability.

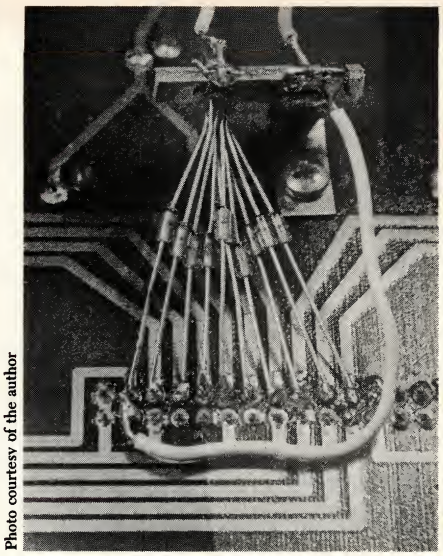

Photo courtesy of the author

Figure 4. The diodes and terminal strip in place on the keyboard circuit board.

auto-key-repeat action begins. I chose their settings so that about a second after the output of U1b becomes high, the output of U1c goes low. Since U1c is connected to the Repeat key (P301, pad 31), this is electrically equivalent to pressing the repeat key. *Voila!* Whatever key started the process now is repeating like mad.

Note that none of the NAND gates are used for their own particular logic characteristics. I could have made a similar circuit using OR gates, monostable-multivibrators, and other devices. But using the four gates of the 4011 chip made the whole design possible using only one chip.

The only component not yet discussed is diode D11. This diode ensures that the charge on C2 is drained immediately upon release of a key. This sees to it that the circuit does not go into auto-key-repeat just because you happen to be typing quickly.

How to build it

Basically, constructing the circuit takes place in three steps: 1) making up the circuit board; 2) soldering a "fan" of diodes onto the keyboard printed-circuit board; and 3) securing the repeater board and connecting it to the diodes.

I found it convenient to construct the auto-key-repeater on a small piece of perforated circuit board. The layout and wiring are not critical, but I designed a printed-circuit board to make the job easier. The foil layout from both the component side and the foil side is shown in Figure 3.

Parts selection is not critical, either. A wide variety of small-signal silicon diodes will work admirably for D1-D11. Before beginning construction, test each diode with an ohmmeter. It should show a high resistance in one direction and a low resistance in the other. (I don't think you need worry about the precise ratio; it will usually be obvious whether something is wrong.) Discard all that fail this test.

To organize all those diodes, I first soldered the diodes' cathode ends (the end marked with the small bar) into one of the holes on a two-lug terminal strip. I fanned out the diodes' anode ends. (See Figure 4.) Then I could prepare to install the strip onto the keyboard printed-circuit board.

I removed the screws which hold the keyboard from the underside of the cabinet. I then slid out the keyboard and disconnected the ribbon-cable that connects to P301. The cable to P301 may be rather short. In that case, you will have to flip up the keyboard and remove the mounting brackets from the underside. Then you can remove the keyboard cover and get at P301 more easily.

I attached the terminal strip (with diodes in place) using an existing screw on the keyboard PC board. And I trimmed each diode to the exact length required to reach the appropriate solder-pad on the bottom of P301. (See Figure 4 for details.)

I soldered one diode to each of the following solder-pads: 14, 16, 18, 20, 22, 24, 26, 28, 30, and 32. For access to the repeat-key, I soldered a wire from contact 31 on P301 to the other lug on the terminal strip. (In Figure 4, this is the white wire going around the lower right.)

After constructing the auto-key-repeat circuit on its perfboard or printed-circuit board, you should test it out as described below.

Checking it out

After completing the auto-key-repeat circuit, test it for shorts with an ohmmeter. There should be at least several thousand ohms resistance between the terminal that will go to ground (7) and

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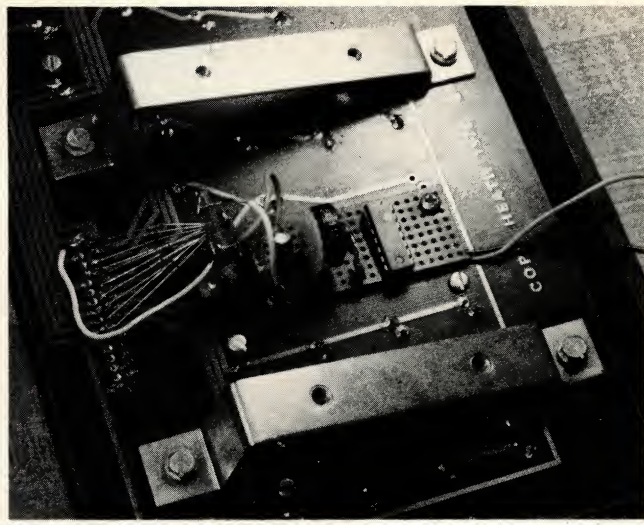

Photo courtesy of the author

Figure 5. The auto-repeat board in place.

the one that will go to +5 volts (14).

After installing the diodes D1-D10, use the ohmmeter to be sure that they are still OK. There shouldn't be any problem, but it's good practice to do a re-check after soldering anything. With the negative lead of the meter on the lug where they are all soldered together, each diode should show a high resistance. Do the same test with the positive lead of the ohmmeter on the common lug—except that each diode should now show low resistance. Replace any diodes that fail this test.

All that remains is to install the auto-key-repeater circuit board, and hook it up to the diode lug and repeat-key lug.

I placed the auto-repeat board over the diodes in the "air space" between the mounting brackets and the keyboard PC board. When finished, the component side should be facing downward, so that it is accessible through the slots in the '89's base. (See Figure 5.)

You will want to ensure that the repeat-board wiring does not come into contact with either the diodes or the keyboard PC board. In the printed-circuit artwork shown in Figure 3, there is space to drill a hole for mounting the board to an existing screw on the keyboard PC board. One option is to use a small standoff there when securing the board.

Then connect the D1-D10 lug to the input, and the repeat-key lug to the output. Power (+5 volts) can be provided by snaking a pair of wires through the '89 to the power-supply area. Connect the positive side to the +5 volt regulator U101; and the ground side to the ground lug near the regulators.

Reattach the ribbon cable to P310. Now turn on the '89 and set the delay to whatever value you like.

If you lay out your auto-key-repeater board the way I did (or use the printed-circuit board shown in Figure 3), then you should be able to adjust the delay control (R1) with a screwdriver through the slots in the bottom of the keyboard. In any case, once you have selected the delay of your choice, replace the keyboard and you're done.

One further word of caution—the keyboard encoder chip (U431), like U1 in the auto-key repeater, is a CMOS device. This means that it can easily be damaged by static electricity.

Although U431 is installed at the other end of the ribbon cable, it is still possible to zap it through careless handling of the ribbon cable. Be sure to work in a static-free environment. Avoid rugs and leather-soled shoes. And before touching the ribbon cable, be sure to ground yourself to the '89 (such as to the metal brace for the CRT). If you should accidentally zap the keyboard-encoder chip, troubleshooting is a breeze. If the computer will only display question-marks and slashes, it's zapped—replace the encoder chip.

Now my '89 keyboard repeats just like the H/Z100-series computers. I no longer find my fingers are baffled when they expect keys to auto-repeat, and they don't.

In fact, considering the small investment in time and money, I wonder why I put off this project for so long!

Ordering Information

Automatic key-repeat circuit; kit, $30; assembled, $38.
California residents add 6% tax.
Analytical Products
20663 Avenue 352
Woodlake, CA 93286
209/564-3687

Auto-repeat adapter, $34.95.
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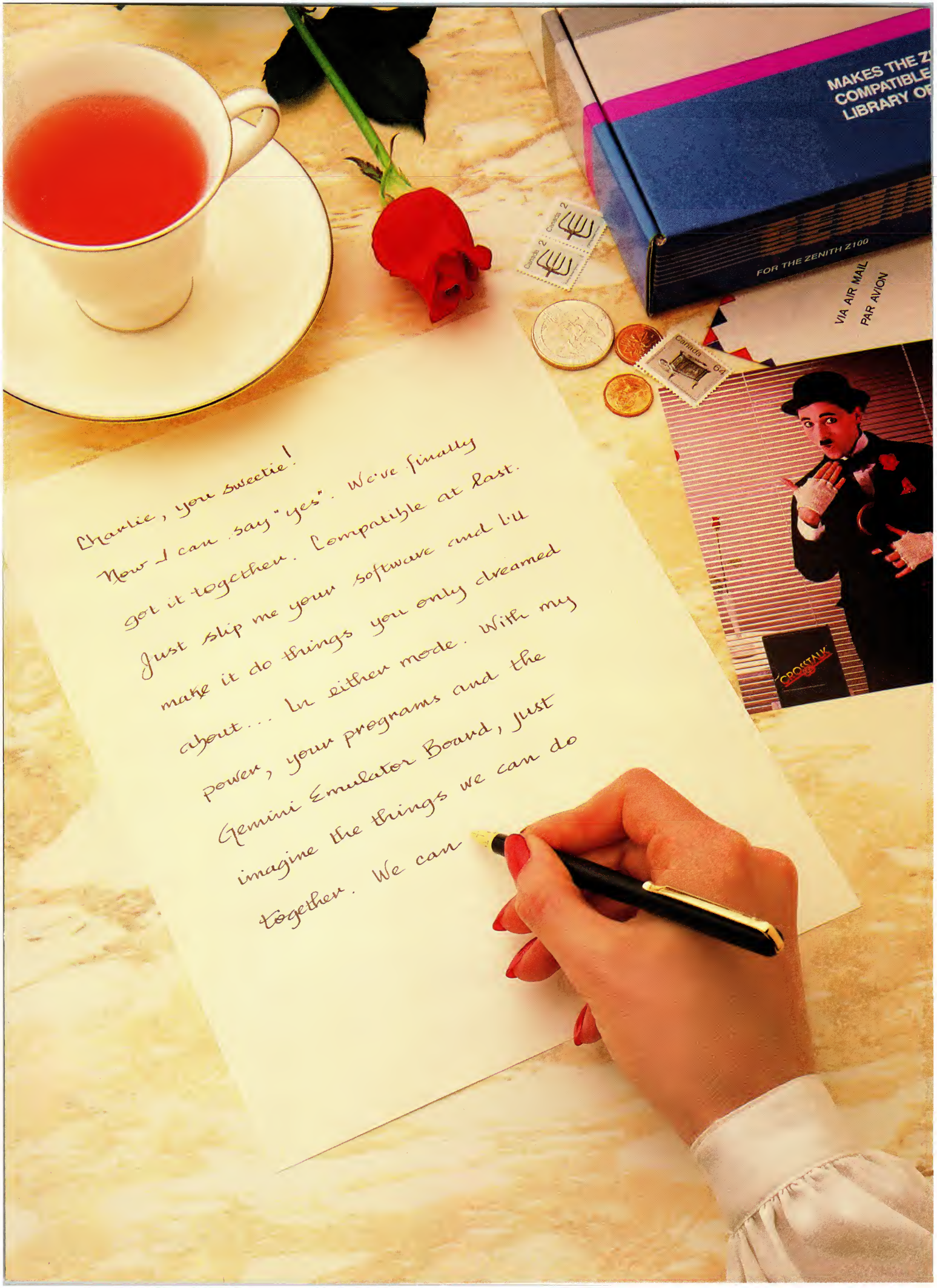
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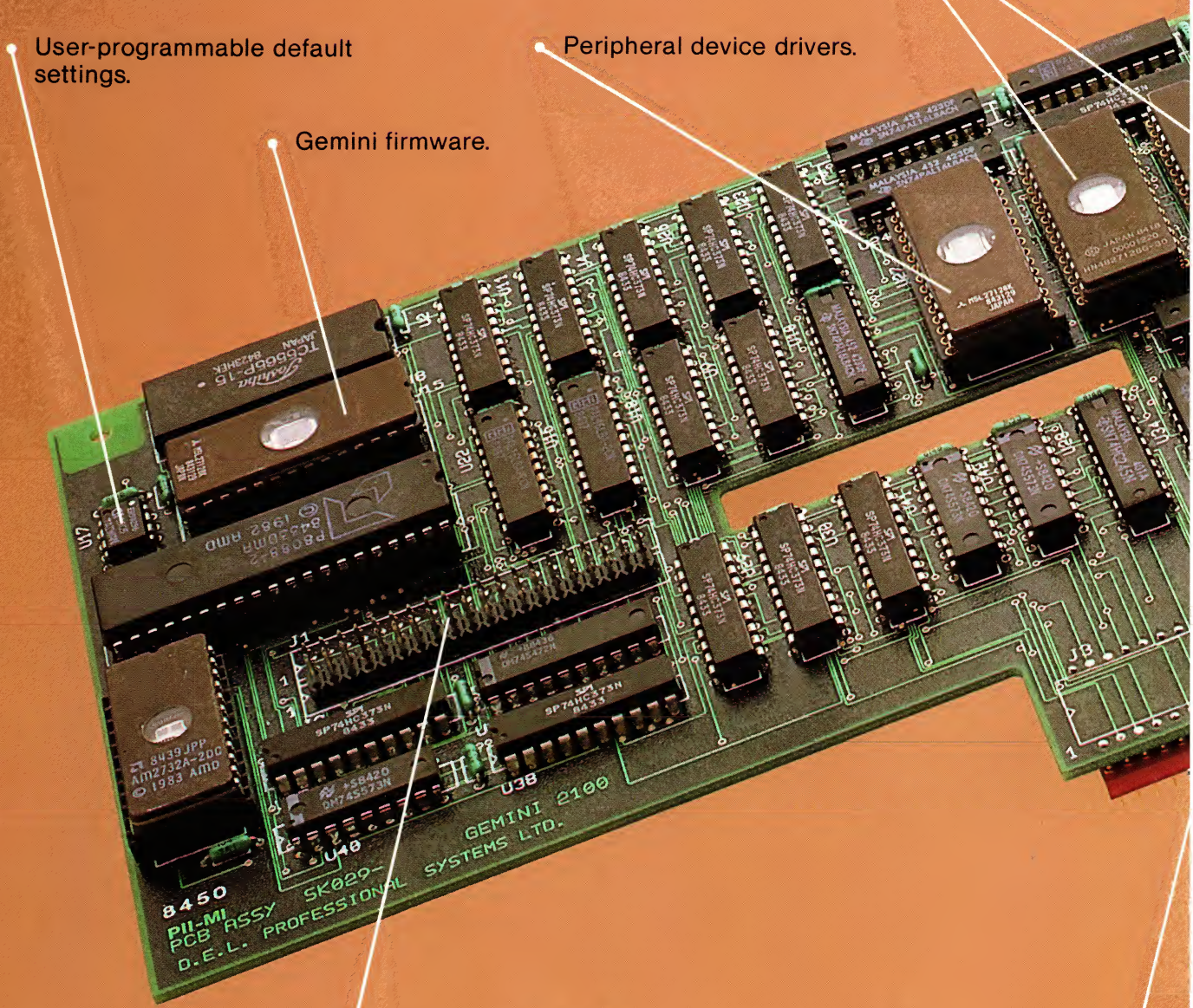
THE GEMINI EMULATOR BOARD



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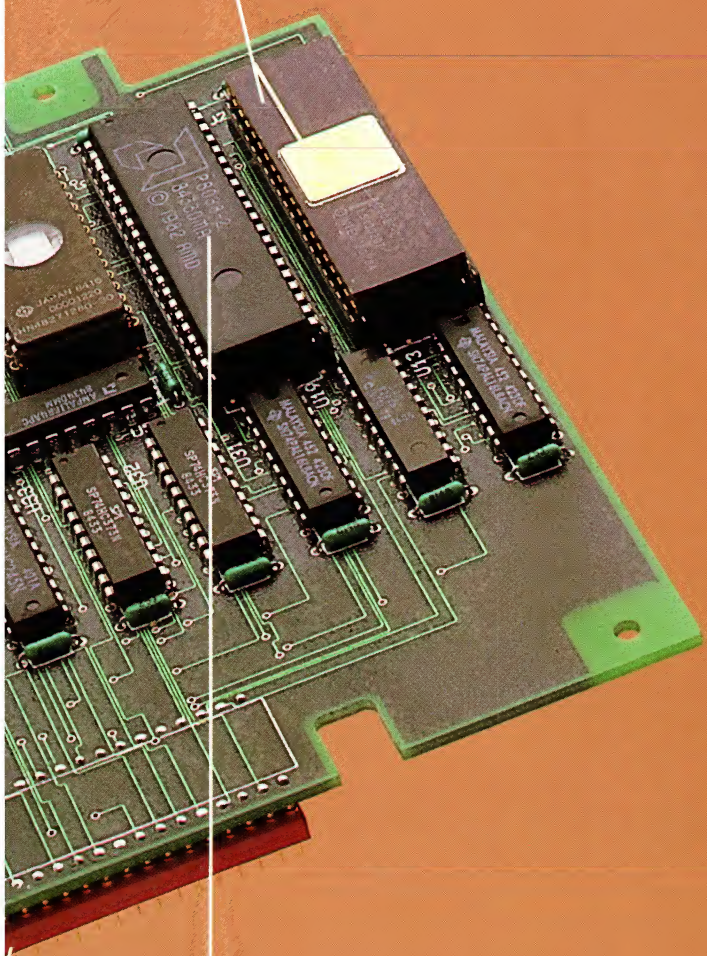

8088 processor, relocated from the Z100 mother board.

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- Up to 8 MHz operation is possible on upgraded computers with 8 MHz processors installed. However, due to possible timing problems, operation at this speed is guaranteed only on factory-built 8 MHz computers.
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- During warranty period, dealer or factory will exchange any faulty Gemini Emulator Board free of charge.
- Warranty does not cover installation charges.
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A: No. Gemini provides two operating modes: Z100 or IBM.

Q: How do I select the Z100 or IBM operating mode?

A: The desired mode of operation is selected by a one key response to a screen prompt at the time of start-up or re-set.

Q: Can I use the software I've already purchased for my Z100?

A: Of course. The Gemini will not impede the original operations of your computer.

Q: Is there any additional software to be installed by the user?

A: The Gemini requires no additional software. However, an IBM compatible operating system will be required to operate in the IBM mode.

Q: Does the Gemini use any of the S100 slots?

A: No. Gemini was designed with a view to other important uses for the S100 slots.

Q: Where is the Gemini connected?

A: The Gemini Emulator Board simply plugs into the 8088 CPU socket of your Z100.

Q: Is the 8087 Numeric Data Processor supported?

A: Yes. The 8087 is supported on board (socket provided) and operates in both the Z100 and IBM modes.

Q: Are IBM graphics supported?

A: Yes. Both high resolution and medium resolution graphics are supported.

Q: Does Gemini run the Microsoft Simulator?

A: Yes. However, the Z100 hardware does not support the sound portion.

Q: Was Gemini developed jointly by Heath, Zenith and D.E.L. Professional Systems?

A: No. It was developed entirely and exclusively by D.E.L.

Q: When? Where? How much?

A: Early summer, 1985. Direct through D.E.L. and selected local retail outlets. About $600 U.S.

Q: How would you evaluate Gemini's compatibility with IBM?

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DEBUGging the Z100 Key Click

Yet another response to a common complaint.

Kenneth R. Van Wyk

I know what you're saying—not another Z100 key click article! But this one is different. It doesn't require running any AUTOEXEC.BAT file (although you still can if you so desire). This method will be totally transparent to the user.

Here's how it works. On boot-up one of the first things done by the Zenith Disk Operating System (Z-DOS) is to load its COMMAND.COM. COMMAND.COM is Z-DOS's command interpreter, and is responsible for interpreting and executing whatever the user types at the keyboard. When you boot the computer, you'll see a message something like this:

Z-DOS/MS-DOS Command Release 1.00, Version 1.20

Then it asks you for the date and the time (unless you're using an AUTOEXEC.BAT file which takes care of that). You know the routine.

Anyway, what I did was to add an ESC x2 at the end of the COMMAND message. When this is printed to the screen, the key click is turned off and everything proceeds normally. You never see anything different or unusual; you just don't hear *that key click!*

Put it in with DEBUG

We'll be using DEBUG, so this is a good place to put in the customary warning: use a disk you can afford to obliterate!

DEBUG will let you put any code you want anywhere you want on disk. If you put it in the wrong place, you can expect trouble. I don't think you'll run into any problems with the process discussed here; but there's no point to playing with a disk if you can't easily replace all the files on it.

In any event, here's how I added the code to disable the key click.

First, call up DEBUG with COMMAND.COM as the file it will be working on:

A:DEBUG COMMAND.COM <CR>

(where <CR> is a carriage return).

At DEBUG's ">" prompt, use the "D" command to display what's at address 550:

>D 550 <CR>

Then you'll see a display like that in Figure 1. Occupying most of the screen will be a whole bunch of hexadecimal bytes; their ASCII equivalents will be on the right side of the screen. There, the Z-DOS command message should be displayed. (If you have a different version than I have, use the D command to look around; start at address 100H and continue until you find the message. Entering D alone will display the next 128 bytes.)

Now you have to change the message.

In my COMMAND.COM, 588 is the address of the end of the message. A 24 hex is there. Look for the $ in the ASCII (right-hand) column of the screen. The $, or 24 hex, ends the print function, thus stopping print to the screen. This is where we wish to add in ESC x2.

So use DEBUG's edit (E) command:

>E 588 <CR>

DEBUG will then display the address and show you the hex byte located there, followed by a period. Simply type in the new hex byte and hit the space bar. Don't hit the carriage return until you're done. When you type the new byte and hit the space bar, the next current byte will appear; and so on, as follows:

0AC3:0588 24.1B 00.78 00.32 00.24 <CR>

As it's given above, the two-digit hex numbers before the periods are the original values displayed by DEBUG; the two digits to the right of the period are the numbers you'll type in. (Hex 1B = ESC; 78 = x; 32 = 2; and 24 = $. The four hex digits before the colon may be different on your system.)

Now, we're done with the changes. So we can write the file back to disk with DEBUG's W command at the prompt, as follows:

>W <CR>

DEBUG will respond with:

Writing xxxx bytes

(or a similar message).

Then quit (Q), and we're back in Z-DOS.

Now reboot and you will have no more key click. You won't have to have any AUTOEXEC.BAT file. (But you can.) And you won't even know that there ever was a key click.

Do you want anything else?

Using DEBUG, you could add more escape codes, of course. And these changes are not limited to just COMMAND.COM. You could easily change messages in any program this way. For instance, you could put in an ESC E in front of some program messages in order to clear the screen. I used this method to personalize my Z-BASIC message.

If anybody has any questions on how to do this, let me know; I'd be glad to try to help you.

It does work!

Additional Information

Kenneth R. Van Wyk
68 New Garden Avenue
Lancaster, PA 17603 △

```
DEBUG  version 1.08
>D 550
09D2:0550  F3 04 E9 10 FC 0D 0A 5A-2D 44 4F 53 2F 4D 53 2D   s.i.|..Z-DOS/MS-
09D2:0560  44 4F 53 20 43 6F 6D 6D-61 6E 64 20 72 65 6C 65   DOS Command rele
09D2:0570  61 73 65 20 31 2E 30 30-2C 20 76 65 72 73 69 6F   ase 1.00, versio
09D2:0580  6E 20 31 2E 32 30 0D 0A-24 00 00 00 00 00 00 00   n 1.20..$.......
09D2:0590  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
09D2:05A0  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
09D2:05B0  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
09D2:05C0  00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00   ................
>
```

Figure 1. Under DEBUG, the D command will display 128 bytes at a time. Terminal-control codes can be patched in at the message ending. The message must still terminate with a $.

Moving Up to MS-DOS 2

Finally: you, too, can use pipes, paths, and subdirectories.

Wayne Rash, Jr.

It's a new world for the Z100 owner. For the last couple of years, owners of IBM computers have been muttering about "pipes," "I/O redirection," "subdirectories," and other cryptic features of their operating system. Owners of Heath/Zenith 100-series computers could only wonder about these marvels—until last fall, when Zenith released its long-awaited version 2 of the Microsoft Disk Operating System (MS-DOS).

As I said, it's a whole new world. And there is a lot that's different from the older world that many of you were used to: the world of the Zenith Disk Operating System (Z-DOS), Zenith's variant of version 1 of MS-DOS.

Overall, MS-DOS version 2 is larger, slower, more capable, more like Unix, and less like CP/M than its predecessor. It still doesn't make the '100 any more compatible with the IBM Personal Computer; trying IBM software may still produce the dreaded "wild interrupt." But now it should be less of a calamity. At least most of the time, MS-DOS should recover its composure and get you back the system prompt.

What is MS-DOS 2?

The latest release of Microsoft's version 2 operating system software from Zenith is MS-DOS 2.19. (At least when this was being written, it was the latest.) This is a significant re-write of version 1, which was first released for the IBM Personal Computer. Z-DOS was released as version 1.1. This was replaced in the fall of 1984 by MS-DOS version 2.13; and then by a rapid succession of releases culminating in the current version, 2.19.

In spite of the fact that the operating system has been almost completely rewritten, it remains nearly 100-percent compatible with earlier versions of MS-DOS.

A few minor incompatibilities do exist; most notable is a problem with dBASE II. It acts as if your data file begins with the end-of-file marker. (There's a patch available from Ashton-Tate.) And as you might expect, some system-level utilities do not work either; but they are replaced by new versions that come with MS-DOS 2.19.

There is also a loss of downward compatibility; software written for MS-DOS 2 may not run under Z-DOS. If you take advantage of the new capabilities afforded you by MS-DOS 2.19, you will begin to move out of the bounds of Z-DOS. MS-DOS 2 can allow you to read and write the nine-sector/track disks used by other MS-DOS machines. But nine-sector/track MS-DOS 2 disks are unintelligible to Z-DOS; even on eight-sector disks, the disk label and the subdirectories cause confusion.

New capabilities

By the time Microsoft got around to writing version 2 of MS-DOS, the company had been working with their version of Unix for a long time. As a result, the design of MS-DOS shows a strong influence from the Unix world.

This version of MS-DOS handles screen operations much more slowly than Z-DOS.

With MS-DOS 2.19, you have the ability to redirect input and output (I/O) to or from nearly any file or device.

Directories can now take on a tree structure, allowing subdirectories to branch off from directories. If you have used Unix, you will also notice that parts of the command structure have taken on some of the characteristics of the Unix operating system.

With version 2, MS-DOS supports device drivers. Under version 1, the code to support peripherals had to be incorporated into the operating system itself. Now, it can be "tacked on." This allows greater flexibility in the devices to be supported.

Directory trees

Everyone who uses Zenith's version of MS-DOS 2.19 makes use of the operating system's new directory structures. Even if you never need them in normal operation, you start off using them: the distribution disks that come from the company have most of their programs on subdirectories. It helps, though, to understand just what they are.

You're already familiar with disk directories. Any of the disk-operating systems used by Heath/Zenith computers has a list of the programs or files contained on a disk. You can see this list by typing DIR at the operating system's command prompt. The computer responds by typing the names of some files, and maybe some additional information.

In MS-DOS 2.19, DIR will give you the first level of the directory, which is called the "root" directory. This is the one that you see unless you tell the system you want to change to another. Branching off from this are additional directories called subdirectories.

Subdirectories roughly correspond to CP/M's user areas, in that they allow you to divide the disk directory into smaller chunks. This feature adds a lot to the usefulness of the Z100's hard disk, since you are no longer faced with an endless list of directory entries.

The problem with CP/M's user areas was that you had to log onto each one to find out if there was anything in it. With MS-DOS, any subdirectories that branch off from the current directory are listed. To see an example of this, take a look at Figure 1 for the directory listing from my WordStar disk.

In Figure 1, the files that have the indication <DIR> after them are subdirectories. Contained within these subdirectories are more files.

In most cases, you would group files within subdirectories according to some common requirement. That way, if you needed to use your copy of WordStar, you might look for a directory called WS and followed by the <DIR> indication. If you use more than one word processor, you might group both of their directories within a word processing directory. Notice the beginnings of the tree structure as this is illustrated in Figure 2.

You can create directories as you need them, and you can move among them at will. You can use the PATH command so that the operating system will know what directories it's supposed to look at, and in what order, to get .COM and .EXE programs and .BAT files.

To make a directory for your copy of WordStar, for example, you use the MS-DOS command MKDIR. (You can

```
 Volume in drive A is WORDSTAR
 Directory of  A:\

COMMAND  COM     16421   11-12-84   11:03a
RVSTEARN         20864    2-09-85   10:05p
WSOVLY1  OVR     41216    1-01-80
WSMSGS   OVR     29056    1-01-80
WS       COM     21376    1-28-85    9:49p
SPELSTAR OVR     22784    1-01-80
ALTCHAR  SYS       431    4-04-84    3:18p
RVSTEARN ADD       896    2-09-85    2:38p
CONFIGUR COM     12031   11-12-84   11:47a
ZDIR     COM      3372    6-01-84    2:58p
CONFIG   SYS        22    2-08-85   10:56p
BYTE           <DIR>      1-02-85    6:15p
SEXTANT        <DIR>      2-16-85    7:23p
HARTWIG  LTR      1920    2-09-85   10:51p
STGLANCE          1280    2-09-85   11:00p
IFAGE          <DIR>      1-10-85    8:31p
RVZ100           14464    2-15-85    7:17p
RVDOS2            4864    2-16-85    9:30p
       18 File(s)    125952 bytes free
```

Figure 1. A directory listing under MS-DOS 2 from the author's WordStar disk.

abbreviate this as MD.) You follow this with a space or a backslash (it doesn't matter which) followed by the name of the directory you want to create. The command line would look something like this:

A>MD\WS

Once you have made a directory, you log onto it with the change-directory command (CHDIR, which can be shortened to CD). If you just enter the letters CD, you are told which directory you are using. If you follow that with the name of a directory, you are moved to that directory. To move to the WordStar directory, you might have a command line that looks like this:

A>CD\WS

If you've used Unix before, you have probably noticed the similarity in the commands used.

Once you enter a subdirectory, you will notice that there are two directory entries listed as . <DIR> and .. <DIR>. ("Dot" <DIR> represents the current directory; "dot dot" <DIR> represents the "parent" directory from which you entered the current one.) This will allow you to use the standard Unix method of exiting a directory—the command line

A>CD..

will take you to the next level up, just as it does in Unix.

While this method of dividing the directories is of limited usefulness on a 5¼" floppy disk, it can become significant on larger disks.

A 10-megabyte hard disk can store as many as 480 directory entries—making it nearly impossible to find a particular file. If you manage your directory structure properly, you can keep directory listings small, making files much easier to find. Still, you can get so many programs and files that finding things can get to be a problem, but you can find additional help through the use of pipes.

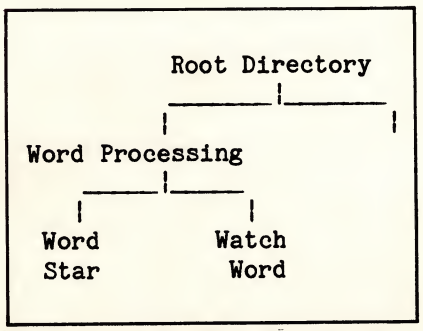

Figure 2. Grouping files by kind produces the beginnings of a tree structure.

Pipes?

Pipes. But not the kind that water runs through. In this case, a pipe is a channel for information. I/O redirection takes the output from a program or a command and provides it as the input to another program (sometimes called a filter) before it is sent on.

The SORT and MORE programs use pipes. (Sometimes SORT and MORE are used together.)

A good example of this is the use of the MORE program with the DIR command. If you have more than 23 files on your disk, the normal listing will make the first files scroll off your screen before the last ones appear. The MORE program takes the output of the directory, and displays it a screen at a time.

You can create a pipe by using the vertical bar on your keyboard. A typical command line would look like this:

A>DIR | MORE

The SORT program will work the same way. In this case, the information being sent to the screen is sorted on the first character before it is displayed. This will give you an alphabetical listing of your directory.

You can even pipe data through two of these "filter" programs. This command line is a good example:

A>DIR | SORT | MORE

The availability of pipes can make using MS-DOS more convenient. But you have to make sure you have enough buffers set up, or you'll wait forever while it happens.

Set up a buffer? Read on, we're getting to that next.

Buffers, files, and devices

When MS-DOS 2 starts up, it looks for a file called "CONFIG.SYS"; if the file exists, MS-DOS reads its contents. MS-DOS will run just fine without any CONFIG.SYS file; but you can enhance some of MS-DOS's operations if you use it.

CONFIG.SYS is an ordinary ASCII file; it serves to tell MS-DOS to set certain operating conditions—memory buffers, device drivers, and the number of files that can be open at one time.

Each of these conditions and drivers takes a little of the available memory; so you need to be careful if you are using a memory-intensive operation. The buffers are simply a portion of memory that is made available to the operating system to reduce the need for disk accesses.

You can specify the number of files that can be open at one time, if you wish. This number can vary from 1 to 99; but there usually is little need to go past 20.

At this time, most of the software that is available to run on the Z100 has no specific requirement for a number of files to be open. That may change as additional software becomes available to the Z100 in the future. Ashton-Tate's dBASE III, for instance, would require you to specify 20 files in CONFIG.SYS.

A number of other features can be specified in the configuration file. You can tell the operating system to load a particular device, such as a console driver; you can tell it to check for a break condition (control-C) more often than it usually does. And you can change the switch character (normally the slash) used with the various switches which modify MS-DOS command execution.

When you get MS-DOS from Zenith, there are two device drivers included. These are MDRIVE.DVD and ANSICON.DVD. MDRIVE is designed to use a portion of the computer's memory as if it were a disk drive.

ANSICON is supposed to translate the American National Standards Institute (ANSI) terminal-control sequences into a form the Z100 can understand.

Zenith euphemistically describes this as a "partial emulation" of the ANSI standard. You should understand that

the emphasis is on "partial." I've tried a number of programs that use the ANSI sequences to control terminal features. Sorry, I can't make my Z100 do anything with them.

Using MS-DOS 2

One of the first things you will notice when you start running the new version of MS-DOS on a regular basis, is that it remembers the date and time from the previous session—even if you don't have a battery-powered clock/calendar board.

This may not sound like a big deal, if you don't have to re-boot several times a day. For those who do, somebody at Heath/Zenith went to the trouble of making the operating system store the date and time on disk every time the disk is written on.

That way, if you have to reset the computer, the time and date is nearly always accurate when the system boots up. When this information is requested, all you have to do is hit the ENTER key. This is one of my favorite features of MS-DOS 2.19.

There are other changes that you will notice about the new version.

As you run a directory, more information is available than was available with Z-DOS. If you look at the directory in Figure 1, you will see that the disk has a label—in this case, WordStar.

You will also see that the level of the directory is indicated. In Figure 1, the listing is from the root directory, indicated as A:\. At the bottom of the listing, the number of directory entries is listed, and the amount of available space is displayed.

If you are using a hard disk, or a high capacity 8" disk, you will also notice that you can find things a lot more easily. You can assign each of your subdirectories to a special task, so that you know where to find the files you need. This makes it unnecessary to divide the hard disk into multiple partitions for MS-DOS. You can also use some very large hard disks with this version of MS-DOS. Version 1 had a size limit of eight megabytes per partition; version 2 can handle up to 64 MB per partition.

Problems

Yes, there are troubles with version 2.

When you run your applications software, you will notice some differences from Z-DOS. The most obvious is slow operation. This version of MS-DOS handles screen operations much more slowly than Z-DOS. Many other companies' implementations of MS-DOS version 2 suffer from this problem, incidentally.

Zenith's version of MS-DOS has also had problems with handling the input/output ports. Printer operation has been very slow, especially on parallel printers. While serial printers have seemed to have fewer problems, the operating system has lost characters sometimes when both serial ports have been running simultaneously.

Fortunately, the serial I/O problems have been corrected in the latest version; and the parallel printing delay is much improved.

Another problem you're likely to notice is MS-DOS 2.19's heavy memory use. This operating system takes up over 60 kilobytes of memory. You may find that some programs that used to run fine on your computer now will not run. Spreadsheet programs will be greatly affected, since they keep their data entirely in memory. If you have one of the machines with only 128K, you should seriously consider adding more memory before you start using MS-DOS 2.19.

You may also run into problems running specific programs. Many of the problems you may encounter using MS-DOS 2.19 really stem from application software that has a conflict with this version of the operating system.

A good example of that is Ashton-Tate's dBASE II, which you will have to patch to make it operate properly. In general, if a program that you have used under Z-DOS suddenly acts up, it's probably getting indigestion from the changes in the operating system.

You also have to be careful about the system utilities you have on your disks. Many of the programs that came with

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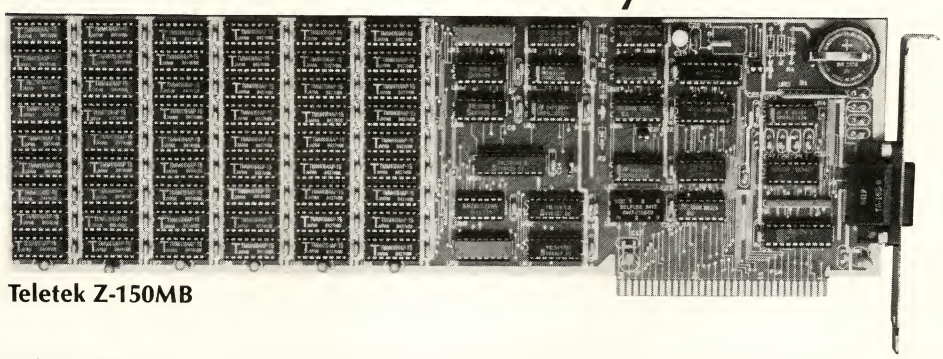

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earlier versions of the operating system will not work right.

The problem is that they have the same name, so you can't tell from looking at the disk directory which one you have. Zenith cautions you about this problem; you're well advised to clear the old stuff off your disks when you change to the new version of MS-DOS.

Finally, there are some programs that were never written with MS-DOS 2.19 as a consideration. These programs can cause you problems ranging from a reduction of capability to a flat refusal to run. The problem with dBASE II has already been noted. And Graham Wideman's IBEm, the IBM emulator, doesn't seem to work at all under version 2.

In addition, many applications are unable to make sense of the directory paths that are so prevalent in MS-DOS 2.19. This doesn't make them unable to run; but you may need to keep a copy of the program and any overlay files in each directory where you plan to use the program.

WordStar is an example of this latter group. The program runs fine within an MS-DOS directory, but it cannot manipulate the directory paths. If you issue the PATH command indicating the directory where WordStar is located, you can load the main program, but not the overlays. In addition, you cannot use WordStar to work with files located in other directories.

Bright spots

All is not gloom and depression, however. If you use the PATH command, any program that does not require overlays, help files, and the like will run fine from any directory.

In addition, there are a number of programs that are being designed to take advantage of MS-DOS version 2. Ashton-Tate's dBASE III, which may be available for the Z100 by the time you read this, makes full use of the capabilities of MS-DOS.

Zenith seems determined to keep its manuals readable.

As well, there is hardware which runs *only* with version 2. StandardNet, the local area network sold by Standard Data Systems, requires the new version of MS-DOS in order to be used with a Z100.

New commands and utilities

As you might expect, a new operating system brings with it a number of new commands. We've already talked about some of those. In addition, a number of new utility programs are included when you get MS-DOS. When you start using the system, you should also note that some of the old commands and utilities have changed or have additional capabilities.

Following are some of the high points. A complete description of all the changes is beyond the scope of this article. (And besides, it would make the folks at *Sextant* think I was trying to hog this issue.)

The **APPLY** command will allow you to automate a lot of routine work. It's similar to batch processing; but at the same time, it will allow more flexibility than a batch file.

APPLY will execute an MS-DOS command or a program. It allows a command parameter to be input either from the keyboard or from a disk file. For instance, you could keep a disk file with a list of files that you wanted to COPY every day. APPLY would do the work, going to your disk file to get the names of all the files to COPY.

ASSIGN will allow you to assign a logical drive name to a Winchester disk partition. CP/M has had a utility like this for some time.

Under earlier versions of MS-DOS, you could set up partitions on your hard disk for logical drives E: and F: and then use them at will. You probably needed both of them, since version 1 of MS-DOS couldn't handle partitions larger than 8 MB. Now, E: is the default boot device on the hard disk; and if you boot up on E:, you will have to ASSIGN the

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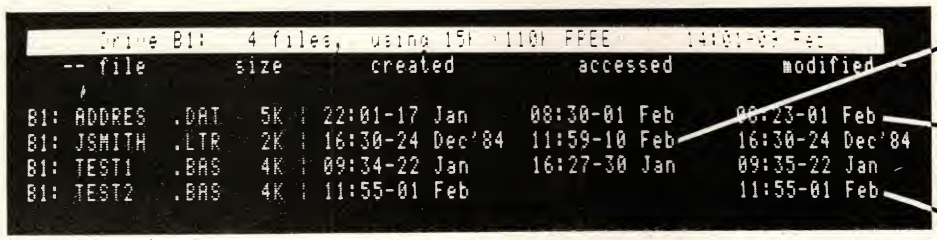
Drive B1: 4 files, using 15k 110k FREE 14:01-03 Feb
-- file size created accessed modified
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B1: JSMITH .LTR 2K 16:30-24 Dec'84 11:59-10 Feb 16:30-24 Dec'84
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other partition to F: before you can use it. That's not really a limitation, however. With MS-DOS version 2's higher limit, there's no need to divide the Winchester into two logical drives.

As noted, you can tell MS-DOS to check for a break condition (control-C) more or less frequently with the **BREAK** command. You need to make sure that BREAK is turned off, though, before you use a program that uses CTRL-C for something besides a break code. To some extent, this depends on the application program; so you should confirm CTRL-C's operation and effect if you plan to make use of the BREAK command.

As mentioned above, the **CHDIR** command will allow you to either check or change directories, depending on what follows the command. If you type CHDIR, or its short form CD, by itself, you will be told the name of the directory that you are in at the time. If, instead, CD is followed by the name of a valid directory, you will be changed to that directory.

If you have several people using your hard disk, you might like the **CIPHER** command. It allows you to encrypt your disk files using a keyword, and to decrypt them with the same keyword. You can encrypt any type of file; but remember that program files will not run until they are decrypted. Zenith had a good time when this part of the manual was written. The sample files have names like WTRGATE.BRK, CIASPY.TXT, and NOSEEUM.DAT.

CLS is a brand new command that Microsoft picked up from Radio Shack's TRSDOS of eight years ago. When you type CLS, the screen is cleared.

CONFIGUR is hardly a new command to Heath/Zenith users, but the version that comes with MS-DOS 2.19 is different from earlier versions. The biggest difference you'll notice is that you can now set the rate at which the operating system gets the disk drives to step between tracks. And you can see what the parameters of the communications ports are. Earlier versions of CONFIGUR for MS-DOS required you to remember; otherwise, you had to reset them if you were in doubt.

COPY now has some improved capabilities. They include the ability to make up for the lack of an "Off Line" key on the Z100, which lets you talk to the terminal directly.

COPY now allows you to copy to or from any device or file, including the console. For instance, if you typed ESC p under earlier versions of MS-DOS, you just got ^[p on the screen. With COPY in MS-DOS 2.13 and higher, if you type

A>COPY CON CON

then whatever is typed at the console thereafter will be echoed right back to the console. Terminate whatever is typed with a CTRL-Z. An ESC p, then, will get you reverse video, not some funny characters. This is what gets around the missing "Off Line" key problem.

You can also use COPY as an easy way to create files directly from the keyboard—an AUTOEXEC.BAT file, for example.

A>COPY CON AUTOEXEC.BAT

Then you enter the commands you want in your batch file, ending the file with a CTRL-Z.

You can reassign the device that performs command input/output with the **CTTY** command. This will allow you to attach a terminal to one of the Z100's serial ports, and turn control over to that with the CTTY command. You would do it like this:

A>CTTY AUX

After you were done with this, you could reassign control to the computer's keyboard and screen using the CON assignment.

You can control what your batch files echo back to you with the **ECHO** command. This will allow you to turn screen echoing on or off for batch commands as they execute. The command can also be used to echo messages to the screen.

The **EXIT** command is supposed to allow you to run MS-DOS commands from within application programs that let you talk to the operating system from within the program. Depending on the program, it also provides a very entertaining way to crash MS-DOS. While trying out the EXIT command from within WordStar, for example, I was able to fill the screen with gibberish, but I was not able to make the EXIT command work right.

You can search through files on your disk for a specific string of text with the **FIND** command. This can be useful if you want to search a list of text files for a particular subject. You can't just search through every file on a disk, though, since FIND won't let you use either the *

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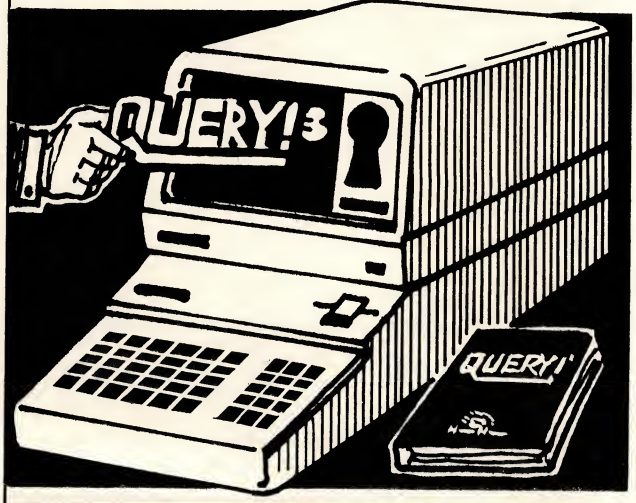

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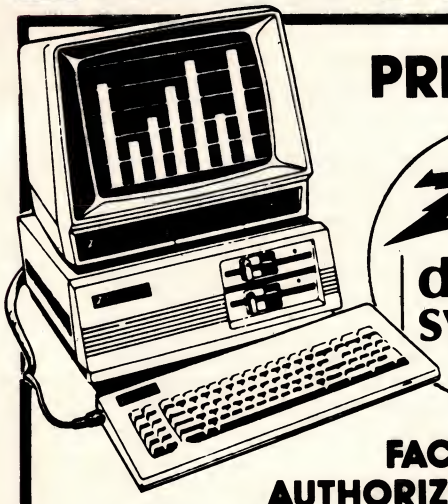

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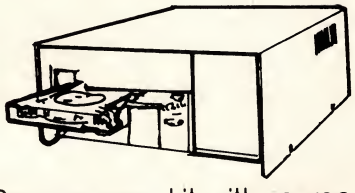

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The Heath connection?

Those of you who have only known Z-DOS (or CP/M) may find MS-DOS version 2's "Unix-like" features discussed in this article to be a welcome advancement. MS-DOS version 1 struck many users as nothing more than a re-tread of CP/M. And CP/M is a *lot* older. A lot of people figure that it's about time that MS-DOS entered the twentieth century.

Those of you who cut your teeth on the Heath Disk Operating System (HDOS), however, may find some of the advances suspiciously familiar.

Of course, HDOS has MS-DOS version 1's only noticeable advance over CP/M: date-stamping files. But HDOS also has a limited form of "I/O redirection": you can send a directory listing to a printer or disk file, for instance. To HDOS veterans, device drivers are pretty ho-hum, too. If you get a new peripheral, you just get a device driver to handle it. There's no need to worry about incorporating the code into the operating system.

The coincidences may not be entirely coincidental.

Those who read Fred Zimmerman's article "HUGCON 1" in *Sextant* #4, Winter 1983, will remember the name J. Gordon Letwin as one of the moving forces behind the "new" MS-DOS. Those who probe around the innards of HDOS will recognize the initials. Letwin wrote the original version of HDOS and left his mark hidden there.

So: Was Letwin already interested in Unix when he wrote HDOS? Or does MS-DOS version 2 establish the inherent superiority of HDOS? I leave that debate to you. The two points aren't mutually exclusive, after all.

or ? wildcard characters.

Alternate character sets can be created, loaded, or redefined with the **FONT** command. This program includes a special editor that lets you design your own characters. You can also modify characters in a character file that's already on the disk.

You design characters by indicating the pixels that will be used to form the character on a grid on the screen. Usually, you'll modify the graphics-character set, but you can modify any set.

The **MKDIR** command allows you to create directories. This command can be shortened to MD, as you saw in an example above. The ability to create additional directories is necessary to the branched structure of the MS-DOS directories. Once you decide that you don't need a directory that you have created, you use the **RMDIR** command to remove it. You can abbreviate that one to RD.

I mentioned the **MORE** program earlier; this is the one that works with a pipe to give you a screenful of text at a time.

If you're logged into one directory and need to call a program or .BAT file that is located in another directory, you use the **PATH** command. This is one of the commands that has a similar usage in the Unix operating system.

The **PRINT** command is used to provide print spooling. You can use a section of the Z100's memory to hold text while it is waiting for the printer, allowing you to regain the use of the computer while printing continues.

Unlike many spoolers, the PRINT command gives you a considerable amount of control over the printed output. You can, for example, set margins, issue form feeds at the end of a file, or print multiple copies.

Use of PRINT while running another program does not seem to degrade performance at all. On the other hand, its opinion of margins seems to conflict

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with the margins contained in files generated by WordStar. My use of PRINT on WordStar files generated some peculiar spacing in the middle of the file.

If you decide that you don't like the A> that MS-DOS uses for a prompt, you can change it with the **PROMPT** command. If you want to feel like you're using Unix, for example, you can replace the normal prompt with a dollar sign. You can, in fact, replace the normal prompt with nearly anything you desire—not just a single character.

Nearly any disk will develop bad sectors over time, and the **RECOVER** program is designed to help you salvage a file that contains a bad sector. You can also try to recover an entire disk. Nearly any file can be recovered, including one that has had its directory entry damaged.

Depending on how badly the disk was damaged before you ran RECOVER, however, you may find out that it will be necessary to clean out garbage from some of the files.

You can locate specific files within the hierarchical directory structure with the **SEARCH** command. (This replaces the TREE command used by IBM's PC-DOS.) Individual files can be located, but you can also use it to get a representation of the directory structure. (Subdirectories will be indented.)

The **SORT** command was explained in detail earlier. You can use it to sort the output of a command or the contents of a file in ascending or descending order.

Documentation

Even though the operating system and its utilities have all of these nifty capabilities, none of this will do you much good unless you can figure out how to use them. This is where good documentation is a significant advantage. Fortunately, Zenith is known for the excellent quality of its documentation.

As a general rule, MS-DOS manuals share a number of common traits. Most of them are printed in the new "bookshelf" size made popular by IBM a few years ago. Most of them also emulate IBM in being cryptic and hard to use.

I'm pleased that Zenith was able to limit itself to following the crowd only in the matter of size. The manual for Zenith's MS-DOS 2.19 uses the same 5½" by 8½" paper that the others do. The book is a lot thicker than the others, and the reason for that is added detail.

The manuals are well written, and they explain the operation of the system and the use of the utilities very clearly. A new MS-DOS user is not likely to have any trouble with the basic concepts of the operating system.

Zenith is also careful to write for the experienced user. They have included detailed sections on advanced concepts for nearly every operation and command.

Unlike other manufacturers, Zenith seems determined to keep its manuals readable. Examples of proper usage are used liberally, and illustrations are used when they can be helpful. The writing is kept light and occasionally is even humorous. This may well be the best manual available for version 2 of MS-DOS.

Conclusions

The main selling point of version 2 is the hierarchical directory structure and its ability to cope with large numbers of files. If you've got a system with a hard disk, the new version of MS-DOS will make life a lot easier for you. Version 1 of this operating system was ill suited to the hard-disk environment in many ways, but version 2 makes up for this. When you have enough files to fill 10 megabytes of space, a little directory management goes a long way.

If you have a floppy disk system, you can think about it a little longer.

Before you think too long, though, remember that the old version of Z-DOS is not being shipped any more. As time goes on, more and more of the software for the Z100 will be written to take advantage of the added capabilities of MS-DOS 2.19.

My personal view is pretty simple to express—I won't go back to Z-DOS. △

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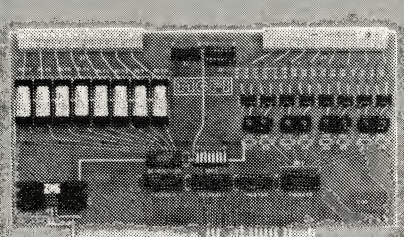

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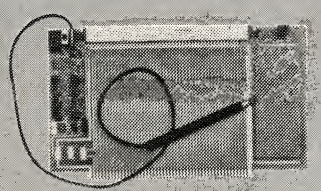
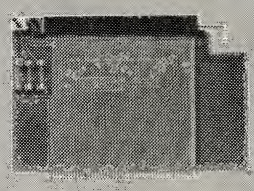


TB-4a EXTENDER BOARD
The latest in our TB line, the most widely used add-ons in the industry. Features logic probe, formed-lead edge connectors, pulse catcher switch and reset button.

$89, assembled and tested.



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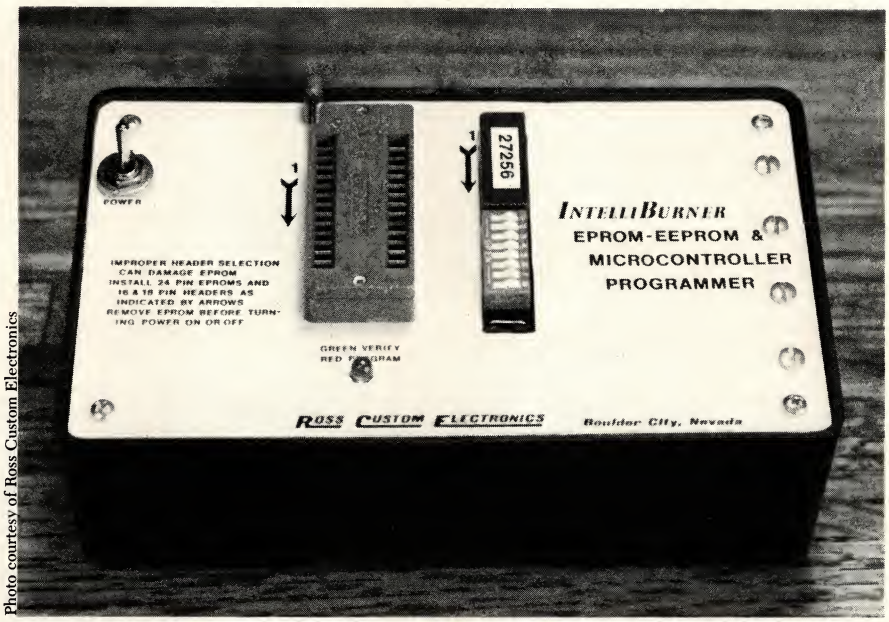
Circle #211 on Reader Service Card

The Intelliburner: Software-Controlled PROM Programming

Ross Custom Electronics brings PROM programming to the masses.

Thomas R. Fox


POWER
IMPROPER HEADER SELECTION CAN DAMAGE EPROM
INSTALL 24 PIN EPROMS AND 16 & 18 PIN HEADERS AS INDICATED BY ARROWS
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27256
INTELLIBURNER
EPROM-EEPROM & MICROCONTROLLER PROGRAMMER
ROSS CUSTOM ELECTRONICS
Boulder City, Nevada

Photo courtesy of Ross Custom Electronics

Nothing means what it says. "Read-only memory" (ROM), for instance, ought to be "read-only": you shouldn't be able to *write* to ROM. And that might have been true, once upon a time. But then someone came along with *programmable* read-only memory (PROM): with the proper equipment, you could write your code to the PROM.

True, it might be self-contradictory (or an assault upon language), but it works. Put the PROM in your computer, and no one will be the wiser. The program in ROM, the firmware, doesn't care how it got there.

After the first indiscretion, though, a PROM is read-only. And self-contradiction, however narrow, is nonetheless expensive. The equipment and software can easily set you back $2,000 or so.

But self-contradiction became cheaper with the introduction of chips that could be erased by means of ultraviolet light. So we have the *erasable* programmable read-only memory (EPROM). Just shine the right light through the little window on top of the EPROM, and it's erased. Another form of EPROM is erased with electrical signals instead of ultraviolet light—*electrically erasable*, the EEPROM. And you can erase and re-write as many times as you like (more or less).

Nothing is sacred. It's not just your computer that can be affected. There's also any of your electronic gadgetry run by a microcontroller—a microprocessor with built-in ROM.

Playing games with the sanctity of "read-only," though, has usually been expensive. Or at least I thought so until I discovered an interesting-sounding programmer from an ad in *Sextant*—the IntelliBurner, from Ross Custom Electronics. Actually, compared to the competition, this programmer sounded like an unbelievable super fantastic bargain! It costs only $299!

Expensive or inexpensive, though, EPROM programmers are *useful*. They are an indispensable tool when designing microprocessor circuitry. There is no equally convenient way to send your circuits the code to test them out.

Surprisingly, though, EPROM programmers are probably used more, not by professionals, but by knowledgeable "users"—people who simply work with a microprocessor-controlled device (e.g., a computer) that contains ROM. These far-sighted people use the programmer to read the ROM into a disk file to create a back-up. If the original ROM gets zapped, an EPROM can be easily programmed to replace it.

I first became interested in EPROM programmers several years back while working on the design of an Intelligent Thermometer—a microprocessor-based instrument. (For details, refer to my article, "Build an Intelligent Thermometer," in the January and February 1983 issues of *Computers and Electronics*.)

I did quite a bit of research at the time on available EPROM programmers. My conclusion? Build my own—commercial jobs were too expensive.

Since I required fewer than 900 bytes of ROM, a 2708 EPROM (with 8 kilobits of memory) could handle the job. My original programmer was wired on a breadboarding socket and used Heath's ET-3400 Microprocessor Trainer as the controller.

Since then, I have redesigned it slightly, built it on a double-sided printed-circuit board, added "friendly" firmware, and called it Ultrapro 1. The only real problem with Ultrapro 1 is that it programs only two EPROMs (the 2708 and the rare and obsolete 2704). In that regard, though, it's not too different from some EPROM programmers that are available commercially.

Recently, I started work on an expansion board for my Heathkit robot, my buddy HERO 1. However, this board requires 16- to 64-kilobit EPROMs—my Ultrapro can only program 4- and 8-kilobit EPROMs. I again checked out available programmers. A relatively inexpensive one would cost $1,000 or so.

It was then that I discovered Intelli-

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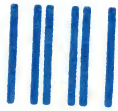

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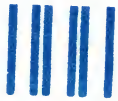

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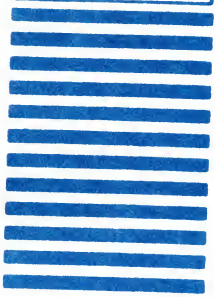

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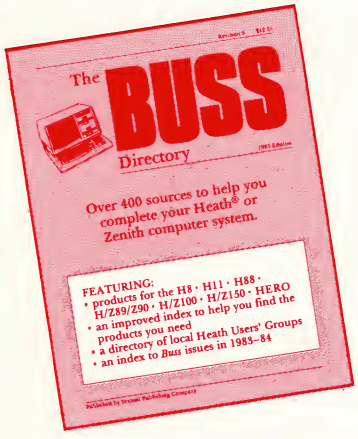
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Amdahl, Nestles, Bell Labs, Jet Propulsion Laboratories, the U.S. Army and Navy, Allied, Bendix, CDR – these are just a few of the many satisfied H-1000 users. They know that the H-1000 gives them performance and compatibility unmatched by the giants. And many distinguished hobbyists have discovered that the H-1000 is available at a very attractive price – typically half the cost of a new IBM-compatible. Just look at the benefits:

- emulates IBM PC with monochrome board; runs most PC software at 4 times the speed
- 100% H89 compatible; runs your programs twice as fast with NO changes
- on-board memory from 128K to a full megabyte; holds twice the data and programs of any comparable PC!
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TMSI has taken the best features of Heath's 8-bit H89 and combined them with the best of the 16-bit PC's to give you the best of both worlds . . . and the ONLY package that builds on your current investment.

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The 16-bit side of the H-1000 features an 8086 running at over 8MHz, offering you the fastest screen response and program execution of any PC compatible on the market today. The standard keyboard and screen emulate an IBM PC with monochrome display; accessory color and graphics boards can extend the emulation even further. The "Ghost disk" is an added bonus; entire disks can be loaded into memory, freeing your "real" drives for another disk. You get instantaneous access to your data that cuts out all that waiting while your computer talks to your disk drive.

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Circle #173 on Reader Service Card

Burner in a *Sextant* ad. After a few days' thought, I wrote out a check for the IntelliBurner with H89 software (hard-sectored disks) and cable. I sent it off to Nevada, hoping someone wouldn't use the dough to play blackjack with—at least not before they shipped out my programmer!

A few days later, I received a reply that the IntelliBurner and cable would be shipped in about three weeks. Three weeks later, I received a letter stating my order would be shipped in a week. It was! According to the head man, J. D. Ross, delivery time is generally about 30 days on completed and tested units and on bare boards from stock. They hope to shorten the delivery time to two weeks.

Love at first byte

The shipment came via United Parcel Service in two boxes. The requested cable was in one; and the other held the IntelliBurner, a plug-in power supply, the manual, two distribution disks, and a wired Personality Jumper Plug (PJP) for a 2732A EPROM. There was also a completed test sheet showing how my unit had done on the company's test routines. (Thinking of those who will want to make up their own PJP but not have any integrated-circuit (IC) chip sockets around, they also included a bare IC header and cover.)

Unless you already have a supply of RS-232C cables and connectors, I would advise that you fork over the extra twelve bucks for the cable—and be sure to let them know the computer and port you are using.

The IntelliBurner is small (6" wide x 3¾" high x 2" deep) and contains two double-sided printed-circuit boards sandwiched together in the box. The programming socket is a good-quality, 28-pin, zero-insertion-force job with hold-down latch. The unit has a power switch, a 20-pin socket for the PJPs, a DIP switch with eight switch positions, a push-button switch that doesn't do much, and a three-color light-emitting diode (LED) that serves as a monitor. It also has a six-pin plug where the RS-232C cable is attached.

The 39-page manual that comes with the IntelliBurner is one of the reasons I immediately fell in love with the machine. (Another reason may be my deep-seated fondness for EPROMs.) The manual contains schematics, a fantastic appendix, and data on many EPROMs and several EEPROMs.

However, the manual contains no data on microcontrollers. Apparently, this data is supplied when you purchase the IntelliBurner accessory required to program microcontrollers. It is interesting to note the IntelliBurner can read the popular 8041 series of microcontrollers. One can then use the data to program the compatible 8741 series of EPROMs for back-up or anything else legal.

Another reason I think so highly of the IntelliBurner is that while it does require separate PJPs for most EPROMs, you can wire them yourself for pennies. (Personality modules, from some large companies that produce PROM programmers, typically cost more than the IntelliBurner itself!) For instance, following the instructions in the IntelliBurner manual's appendix, most PJPs can be made by simply sticking short pieces of #24 wire in 16- or 20-pin IC sockets! If you are exceptionally lazy, you can buy wired and labelled PJPs from Ross for $5 each.

Using the intelligent IntelliBurner with DumBurner software

There is at least one reason why the IntelliBurner is so much less expensive than the alternatives. They are usually stand-alone units, doing all the work themselves. The IntelliBurner uses the power of your computer.

In that regard, IntelliBurner is based on the same idea as the DumBurner, also produced by Ross Custom Electronics. The DumBurner is a programmer driven exclusively by software running on your computer. So it's not surprising that the IntelliBurner is supported by DumBurner software—as well as by its own firmware for the IntelliBurner mode discussed below.

The DumBurner software I received was on 5¼" CP/M hard-sectored disks. Two disks were supplied. On the first disk were the files: INSTALL.COM,

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PROM.COM, README.DOC, USE.DOC, and LICENSE.DOC. The files on the second disk were: PROM.MAC, PROM1V17.BAS, PROMV17.BAS, and LICENSE.DOC.

The files on the second disk shouldn't be considered superfluous. They aren't needed to run the IntelliBurner, but they may be of immense interest to many readers since they contain the source code (in Microsoft BASIC) for the DumBurner software. (Since October 1, 1984 the DumBurner software has included "Tool Kit on a Disk". This Tool Kit includes a binary editor and several conversion programs. For those who purchased the DumBurner software before October 1, 1984, eight bucks will get you the update.)

After you copy the distribution software and put it on a bootable disk, the next step is to print out the README.DOC and USE.DOC files. The USE.DOC is basically a user's manual for the DumBurner software. Unlike the well written IntelliBurner manual, this documentation is sometimes confusing and not exceptionally well organized. Nonetheless, it is useable.

A dummy's guide to installing the DumBurner software

In order to configure the software for your particular computer, you must run the INSTALL program. It is obvious from this program that Ross favors my beloved H89—the H/Z89 options are listed at the top of each menu! (Ross owns an H89 and did much of his original EPROM programmer work with that machine. The company also uses a Z100 with a hard disk drive.)

When the second message shows up on the INSTALL program:

"Exit with Default Options INSTALLed?<NO>"

press RETURN. There are no default options built into the software yet. Also, for the IntelliBurner, make sure you press RETURN after the last question, "Enable Fast Hex Programming?". It's <NO> again; IntelliBurner firmware version 1.2 for Fast Hex Programming won't likely be ready for some time. (This option *can* be implemented with the DumBurner software.) Also, for communications speed, make sure you install 9600 baud and not 19200 baud. The higher speed seems a bit error prone.

Getting started

Now you can hook up the cable between the IntelliBurner and the proper port on your computer. In the H/Z89, that should be the DTE or modem port at address D8. Then check that the jumpers on the IntelliBurner are installed for 9600 baud. (Refer to the IntelliBurner manual.)

As noted, a PJP for the 2732A is supplied with the unit. Unless you already have a good supply of 2732As sitting around, I recommend you make your own PJP for the 2716—2716s are cheaper in case you zap a couple of EPROMs in the learning process. Wire the PJP according to the instructions in the IntelliBurner manual.

A 16-pin header or IC socket is used for the 2716 PJP. Make sure you insert pin 1 of the 16-pin PJP into pin 3 of the IntelliBurner's 20-pin PJP socket—four empty socket holes (pins 1, 2, 19, and 20) will be left. If that sounds like it could get a bit confusing—that's because it can! To simplify life, it would have been nice of Ross to use and refer *only* to 20-pin PJPs.

With DumBurner software, position 8 on the DIP switch should be in the "off" position. Consult the supplied data sheets for the positions of the other switches. Notice you have two choices here: fixed 50-millisecond pulse or Intelligent Pulse Algorithm (IPA). We'll get into IPA later; for now, choose the 50-ms pulse settings.

Turn the IntelliBurner on, but do not insert an EPROM. Type "PROM" on your computer. When the master menu shows up ("Mode Options") and requests that you ENTER OPTION, choose "C", (check for Clear EPROM). If the dreaded message "NO RESPONSE FROM PROGRAMMER" appears, you have trouble. If so, check all baud rates; and if you haven't already, read carefully all the documentation supplied.

If it still ain't workin'...

If the documentation doesn't help, a call is in order to Ross. Their phone number is 702/293-7426.

While I didn't experience a problem with my unit, I did call Ross for information. When I called the first time, I talked to Mr. Ross's secretary, Doris Page. Ms. Page told me Mr. Ross was out of town and she asked if she could be of help. She sounded quite nice and friendly, even before I mentioned I was submitting an article to *Sextant* magazine.

Apparently, Ms. Page is quite knowledgeable about computers and fantastic with a soldering iron, although she does not claim to be an electronics expert. If she can't solve your problem over the phone, her boss, J. D. Ross, probably can. I talked with Mr. Ross the following day.

By the way, the IntelliBurner has a 90-day warranty.

If you haven't seen smoke yet, continue...

Next, try writing a file to disk from the empty socket. This is done by going to the master menu and choosing the "W" (Write to disk file) option. This dry run should produce a disk file of all ones (hex FF's). Also, make sure you choose the "T" (Text) option when the next short menu shows up.

You can call this file anything you like, but I called it NULL. This brings up one of the confusing points in the documentation. If you want to become confused right along with me refer to the last

EMULATE

A program which allows the H89 to read/write to the following disk formats.

Osborne 1	SSSD	Morrow MD2	SSDD	Cromemco	SSDD
Osborne 1	SSDD	Morrow MD3	DSDD	Cromemco	DSDD
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Xerox 820	SSDD	Televideo 802	DSDD	CDR 80TK	DSXD
DEC VT180	SSDD	Actrix	SSDD	NEC 8001	SSDD
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DEC Rainbow	SSDD	TRS80-4 CP/M	SSDD	Z100 40TK	DSDD

Many additional formats are being added—check with us. Uses a modified version of CP/M 2.2.03 or .04 BIOS which is included with the program. Allows the use of virtual drives and reading of 40-track disks in an 80-track drive.

Please include your CP/M serial number when ordering.

For H37 with Heath CP/M $59

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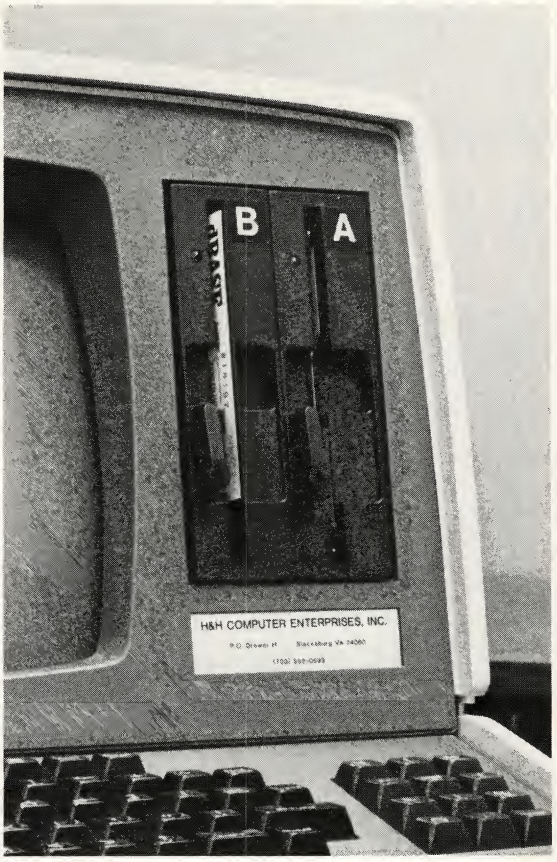

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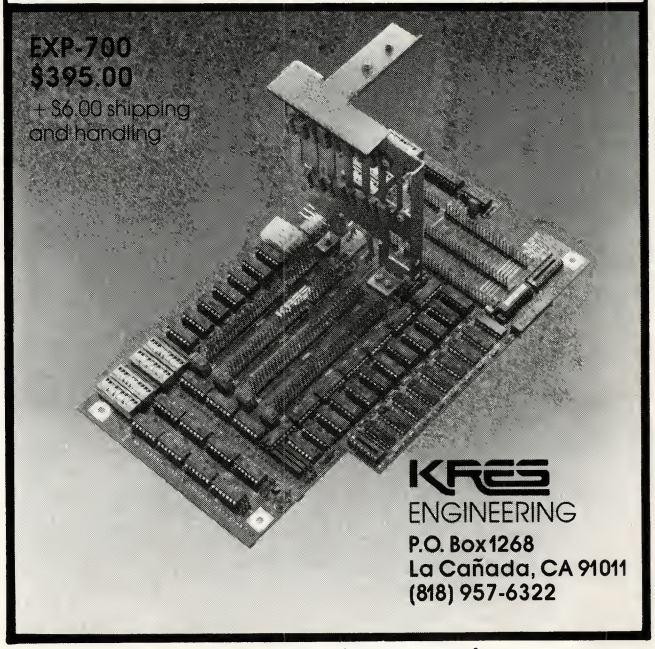

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paragraph on page 2 of USE.DOC.

There, the documentation recommends that you name your source file to be transferred to EPROM as TEMP.XXX, where XXX is COM, HEX, or DOC, depending on what format option you are programming under: C, T, or H. (Not too many people will be putting .COM files into ROM, so I won't mention the C option further.)

The reason given for renaming the source file TEMP.XXX is to avoid the annoyance of "... continually [having] to tell the programmer which file to program into EPROM." This may be true if you are mass producing one particular programmed EPROM. Otherwise, I don't find it annoying to tell my H89 which file to use. However, I do find it excruciatingly confusing having to rename every file TEMP.XXX. (Maybe it's because I have a bad memory.) So I ignore the documentation and name the file whatever I wish.

Time to burn

Now for the real fun—burning (a buzz word for programming) an EPROM. I'll assume here that you are going to attempt to program a 2716 EPROM; and that you have already inserted the appropriate PJP in the socket; and that you've set the switches as indicated in the data sheet supplied with the manual.

Making sure that the IntelliBurner is on, insert the 2716 in the programming socket. Remember that the programming socket has 28 pins and the 2716 has only 24. Make sure you insert pin 1 of the 2716 in pin 3 of the socket. There should be four empty socket holes at the *top* of the programmer. (The top is the side with all the cables sticking out.) Secure the IC with the latch.

When the master menu appears (Mode Options:), type "P" for Programming. When "File Options" shows up, type "T" if the file is Text or "H" if in Intel Hex Format. In practice, the "T" format is used mainly when copying files and for programming EPROMs directly in the source code of a high-level language such as BASIC. The "H" format is used whenever one's file is in Intel Hex Format, which is explained quite well in the IntelliBurner manual.

Next, enter the name of the file containing the code you wish to burn into the 2716; and when the screen shows

INSTALL PROM NUMBER 1 OR Q TO RETURN TO MENU

press RETURN to start programming. Notice that the moment programming starts, the LED on the IntelliBurner turns red. If you wish to abort programming, make sure you hit the Q key once or twice (until the master menu shows up). Failure to do so (for instance, by using the computer's RESET key to abort) may leave the IntelliBurner in the program mode; that means your EPROM may be damaged when you remove it from the socket or even if you shut off the power.

If everything is proceeding OK, the screen should show a long list of:

BYTE XXX PROGRAMMED AS HEX YY

Using the DumBurner software and the fixed 50-ms programming pulse, the IntelliBurner takes about a minute to program 1K bytes of data. In addition, it takes about ten seconds to verify the data. Thus it takes approximately two minutes and 20 seconds to program and verify a 2716 EPROM.

Verification takes place automatically after programming. If an error is detected, the following message is displayed:

ERROR--BYTE XXX PROGRAMMED AS YY VERIFIED AS ZZ HEX

Here's hoping you never see it.

While the documentation covers things fairly well, you should be aware of several points concerning the data file you would like burnt into an EPROM.

With the "T" format programming option, the DumBurner software *always* starts at memory location 0 of the EPROM and burns in the first byte of data at this point. With the "H" format option, which is used for the Intel Hex Format, it is possible to start at *any* address desired in the EPROM.

However, with the DumBurner software, the HEX file on your disk must be in the same order as you wish it to appear in the EPROM. This can be a minor annoyance if you wish to place a number of subroutines on one EPROM. With the "IntelliBurner" mode, there is no need for sequential order. Also, programming is faster in this mode; and there are several other advantages.

For copy cats only

Copying EPROMs is a very popular (sometimes even illegal!) use of EPROM programmers. The thing to keep in mind when copying using the DumBurner software, is that you want to stay in "T" format when writing a file from EPROM to disk and when programming another EPROM. Keeping this in mind, all you need do to copy an EPROM is use the "W" (write to disk file) option to write a file. (The name is your choice.) And then use the "P" or "F" option for programming.

For those who are impatient

If you really want to get things a-hummin', set the DIP switches for IPA programming. Also use the "F" (Fast Program) option. (Note: With 50-ms fixed pulses, the "F" option does not speed up programming.) With IPA and the "F" option, programming proceeds about eight times as fast as with the fixed-length 50-ms pulses.

However, for many of the smaller EPROMs, such as the 2716 and 2732, IPA programming is not supported by the manufacturer of the chip. Nonetheless, Ross claims good success with

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```
CHARACTER TO WAIT FOR AT END OF LINE --- h00
RESPOND TO XON/XOFF FROM REMOTE -------- TRUE
BIT RATE ------------------------------- 9600
REMOTE INPUT BUFFER SIZE --------------- 5000
FULL DUPLEX ---------------------------- FALSE
```

Table 1. ACCESS parameters which were changed from default values to make it work with the IntelliBurner.

IPA with nearly all EPROMs. Note that with some of the larger, more expensive EPROMs (such as the 27128 and 27256), the manufacturer supports *only* IPA.

With IPA, the programmer shoots a one-millisecond pulse at the EPROM and then checks whether the byte is programmed. If not, it shoots another pulse and then checks again. As soon as the byte is programmed, the programmer gives a "booster" pulse that is three or four times as long as the number of one-millisecond pulses shot at it.

A quick look at the IntelliBurner mode

Using the IntelliBurner mode, firmware in IC203 (a 2732 EPROM) replaces the DumBurner software on disk. For this mode, you will require terminal-emulator software, which we will call "modem software." (Note: modem software isn't actually required to use this mode. You can connect the IntelliBurner to your computer as if it were a printer; then use CP/M's PIP command to send your file. However, this is somewhat involved; I only recommend it for specialized applications.)

To configure the IntelliBurner for IntelliBurner mode, set position 8 on the DIP switch to the ON position. The manual also recommends that you start out at 1200 baud. However, if you have modem software that can handle the XON/XOFF handshaking protocol, 9600 baud shouldn't cause any problems.

Since I used ACCESS by Hilgraeve, Inc., I will briefly note how I changed ACCESS's default options to get the IntelliBurner up and burnin'. (See Table 1.) I only include here the changes I made and not the default parameters I left in place.

Actually, my choices on two of the parameters, 5K buffer size and half duplex, aren't absolutely necessary. These are something of a personal preference. If you set the computer for full duplex, nothing will show on the computer when you type in commands such as DUMP or PGM. This is because the IntelliBurner does not echo characters to the screen sent from the host computer. When you reset the IntelliBurner in this mode, a nice sign-on message appears. This lets you infer that the baud rate is set correctly; and it tells you in plain English which EPROM the DIP switches are set for.

Since the IntelliBurner manual does a good job of explaining the programmer's use in this mode, I do not feel it is necessary to amplify it further. A few notes may be in order, however.

In a sense, using the programmer in the IntelliBurner mode is somewhat cruder than using it with the DumBurner software. Mr. Ross says most H/Z89 users use his software. Reason? It is more "friendly." (Where have you heard that before?) However, the DumBurner mode is definitely slower and sometimes more awkward. Even so, if you experience handshaking difficulties, it probably is wise to stick with the supplied DumBurner software.

Four hundred words or less on what I don't like about the IntelliBurner

I guess it's pretty obvious I think quite highly of the machine. One thing that I detested when I started working with the IntelliBurner, but which doesn't bother me a whole bunch now, is the fact that there is no *genuine* reset switch. In order to reset the machine, you must turn the unit off and then on.

Actually, that part ain't so bad. However, you are not allowed to leave an EPROM in the socket when you turn the power off or on! I was told by the boss himself that the company is looking into the possibility of changing the software so that the (What's that darn thing for again?) push-button switch on top of the box will function as a reset switch. I hope it works out.

There's another "hidden" shortcut previously used in the IntelliBurner's design that had no ill effect on Heath/Zenith equipment, although it gave me the jitters thinking about it. It's the fact that the IntelliBurner's RS-232's output lines were not run at true RS-232C levels; instead, they operated at transistor-transistor logic (TTL) levels.

TTL signal levels generally vary between .5 volts and 4v; the *minimum* swing under the RS-232C standard is +5v to –5v; +12v to –12v is typical with Heath systems. The greater signal in the RS-232C standard is intended to ensure good transmission even when the terminal is connected to the computer by 200 feet of cable. That's not something most microcomputer owners have to worry about.

Theoretically, using the TTL levels might have caused problems, but practically speakin' it didn't seem to—with Heath/Zenith equipment, that is. It turns out that the IBM Personal Computer was not so accommodating. So the IntelliBurner now runs at true RS-232 levels. (We may not need it, but it's nice to know it's there.)

There is one problem I didn't detect myself. (J. D. told me about it.) And apparently it has been solved—the "skewed-byte syndrome." This problem also showed up in the original design of my Ultrapro 1 and in another programmer I worked with. It has to do with the programmer's occasionally failing to program the first byte of data properly. It has apparently been completely solved.

One other minor complaint. The plug that connects to the RS-232C cable isn't as securely mounted to the case as I would like. This is only a problem if one wants to disconnect the cable, which seldom is necessary.

Conclusions and recommendations

Don't let the IntelliBurner's relatively low cost fool you. This is a powerful machine that can program just about any EPROM in existence. I have successfully programmed 2716, 2532, and MCM68764 EPROMs. I didn't test it out with EEPROMs or microcontrollers; but, with an accessory, it apparently programs many of these, also.

And if you do purchase the IntelliBurner—life will be made a bit simpler if you also purchase the cable from Ross.

The latest development with IntelliBurner is IntelliBurner+. Now you can plug an optional random-access memory (RAM) board into IntelliBurner. This will allow you to duplicate EPROMs as large as 256 kilobits. The firmware has been beefed up to handle the RAM. (And it's still affordable.)

Since it makes excellent use of the host computer, the IntelliBurner appears to be as sophisticated as stand-alone programmers that cost from three to ten times its price. While Ross is now selling software for just about every computer around, it makes me feel good to know they designed the original DumBurner using an H89 just like mine.

Ordering Information

IntelliBurner, complete, $299; bare board with software and firmware, $99.
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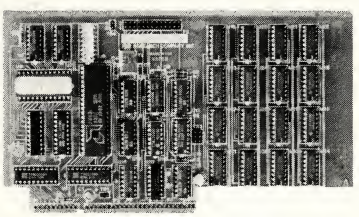

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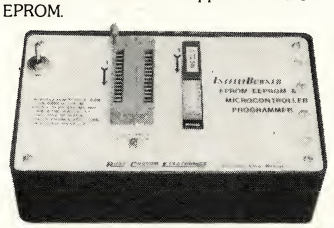

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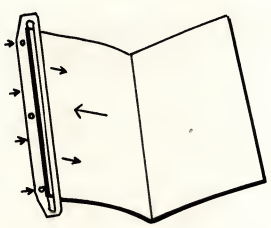

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Daniel N. Jerome

Are you looking for a superb printer driver for CP/M? One that will run rings around CP/M's LIST.COM? In my opinion, UD.COM/Spooler version 2.0 is definitely it!

Produced by Jim Teixeira's SoftShop, this driver's capabilities far exceed anything else I have seen for use with CP/M. It costs only $39.95 and works with virtually any printer, from the dot-matrix type to the letter-quality models. I use it with my Heathkit H89A computer system, which includes an Epson MX-80 printer.

The problem with many CP/M printer drivers, of course, is that they aren't really "drivers."

Under the Heath Disk Operating System (HDOS) and version 2 of the Microsoft Disk Operating System (MS-DOS), peripherals are controlled by "device drivers." The management of device drivers is built into the operating system; but the device drivers themselves are just "tacked on." They can be as large or small as needed, giving you a lot of flexibility.

Under CP/M, however, the method of printing is frequently incorporated into the operating system itself, as a modification to the basic input/output system (BIOS). So it is usually kept fairly simple, else the code can become quite difficult to incorporate into CP/M.

Controlling peripherals in this way can make it easy for the user to set the options under CP/M's CONFIGUR utility. But the options are usually pretty limited. That, perhaps, is why Heath/Zenith included LIST.COM with CP/M. It is still quite limited, though.

Well, CP/M doesn't support device drivers. So SoftShop has accomplished the same job with an ordinary .COM program; but one considerably better than LIST.

Setting UD.COM

The UD.COM/Spooler disk is composed of only two working files: UD.COM and SETUD.COM. Each file requires only 6 kilobytes of disk space.

UD.COM can support eight separate "printer units" numbered from UD0 through UD7. These can be different printers, or different configurations of the same printer, or both. Each of these units is settable according to a list of 18 parameters.

Hardware characteristics you can set include port address and communications speed (baud rate). And you can choose among the handshaking protocols you're likely to want. UD.COM supports the hardware handshaking protocols that Heath/Zenith CP/M supports on the H8 and H/Z89: DSR, Inverse DSR, CTS, and Inverse CTS. It also supports two software handshaking protocols that you can't get with Heath/Zenith CP/M alone: XON/XOFF and ETX/ACK. This is particularly beneficial since so many printers can use them.

And you can set your printing features and options. You can set your printer for characters per line, lines per form, and lines per page. You can set the left margin and expand tabs. You can get pagination and double spacing. UD.COM will handle single-sheet printing; and it

```
UD.COM Version 2.1, Copyright (c) by J. Teixeira and C. Layman

Option                    UD0   UD1   UD2   UD3   UD4   UD5   UD6   UD7

Port Address  (0-377Q)  340Q  340Q  340Q  340Q  340Q  340Q  340Q  340Q
Baud Rate  (110-19200)  9600  9600  9600  9600  9600  9600  9600  9600
XON/XOFF       (Y or N)    N     N     N     N     N     N     N     N
EXT/ACK        (Y or N)    N     N     N     N     N     N     N     N
DSR            (Y or N)    Y     Y     Y     Y     Y     Y     Y     Y
Inv DSR        (Y or N)    N     N     N     N     N     N     N     N
CTS            (Y or N)    N     N     N     N     N     N     N     N
Inv CTS        (Y or N)    N     N     N     N     N     N     N     N
Char/Line       (0-255)  080   080   080   080   080   000   132   132
Lines/Form      (0-255)  066   066   066   066   066   000   132    88
Lines/Page      (0-255)  060   060   060   060   060   000   000   080
Left Margin     (0-255)  004   004   004   004   004   004   010   010
Expand Tabs     (0-255)  008   008   008   008   008   008   008   008
Pagination     (Y or N)    Y     Y     Y     Y     Y     Y     Y     Y
Double Space   (Y or N)    N     N     N     N     Y     N     N     N
Final FF       (Y or N)    Y     Y     Y     Y     Y     Y     Y     Y
Single Sheet   (Y or N)    N     N     N     N     N     N     N     N
ASCII String   (Y or N)    Y     Y     Y     Y     Y     Y     Y     Y

Type RETURN for menu:
```

Table 1. The options settable under UD.COM. This display appears when you type SETUD. Hitting the RETURN key results in the menu shown in Table 2.

```
S ..... Show present option settings.
H ..... Change hardware options (first eight items).
0 - 7 .. Change feature options on unit indicated.
R ..... Change RAM location of UD.COM.
E ..... Exit SETUD.

Your command?
```

Table 2. SETUD's menu. Typing an S will take you to the display shown in Table 1. Typing a unit number will take you to the display shown in Table 3.

```
Char/Line ..... (0  -  255) ..... 080?
Lines/Form ..... (0  -  255) ..... 066?
Lines/Page ..... (0  -  255) ..... 060?
Left Margin .... (0  -  255) ..... 004?
Pagination ..... ( Y or N )  ..... Yes?
Expand Tabs .... (0  -  255) ..... 008?
Double Space ... ( Y or N )  .....  No?
Final Form Feed. ( Y or N )  ..... Yes?
Single Sheet ... ( Y or N )  .....  No?
ASCII String ... ( Y or Y )  ..... Yes?
..022Q..024Q..033Q..106Q..033Q..110Q..033Q..062Q

Type Return for Menu
```

Table 3. If you choose to change the features set for a given printer unit, this display will appear on the screen a line at a time. After you give the setting for the feature on one line, the next will appear. The ASCII string shown is the octal representation of the string sent to the printer. Here, that is CTRL-R, CTRL-T, ESC F, ESC H, ESC 2. This sets up the MX-80 in the manner described in the text.

will give you a final form-feed if you want.

UD.COM will also send to the printer any ASCII string you select, up to 16 characters (both printable characters and control characters). I use this to give my MX-80 printer the codes it needs to handle the printing options described below.

To set your options, you first call up SETUD.COM. A data table like that shown in Table 1 will then appear. When you hit RETURN, the menu in Table 2 will show up on the screen. If you wish to change the options for one of the units, you type in its number and a display like that in Table 3 will appear, a line at a time. Options are easily set by typing the desired value at the question mark.

The new options will be installed when you exit and will appear on the table the next time SETUD is called up. In this way, you can easily tailor each printer unit to match your requirements following the clear instructions in the user's manual.

For example, in setting up your options, consider the following possible choices:

(A) UD0 set for normal *data-processing* text at 10 characters per inch (c.p.i.), providing dates, page headings, and page numbers. This is for standard, everyday printing. (In Table 3, the line under "ASCII String" shows in octal the string UD0 uses to set up my MX-80 for this.)

(B) UD1 set for *emphasized* printing at 10 c.p.i. for special purposes, or just to look pretty.

(C) UD2 set for *double strike* printing at 10 c.p.i. This is a dark format similar to *emphasized*, but a little dotty. Because of the higher than normal contrast, the printing stands out better. I use it when I want to perform a rapid data check on huge technical data tables.

(D) UD3 set to operate a letter-quality printer out of port 320Q.

(E) UD4 set to provide a spare *data-processing* style similar to that of UD0; except that the driver could be set to provide two columns of text to emulate magazine printing.

(F) UD5 set to normal printing, but with page and form length set to zero. This would accommodate certain programs (such as "Catalog System" by The Software Toolworks) which automatically set their own page and form values.

(G) UD6 set to 17 c.p.i.: tiny characters compressed both horizontally and vertically. This could be used to print a list of disk files for pasting on the back of the disk jacket. It could also be used to shorten certain files, provided the user doesn't care if the printer prints on the paper folds.

(H) UD7 set to compressed characters as in UD6; but it could also be set to provide pagination and the proper upper and lower margins on the paper.

Using UD.COM

UD.COM functions by loading itself into high memory—near where CP/M loads its basic disk-operating system (BDOS) and basic input/output system (BIOS). UD.COM monitors CP/M for calls to the printer from PIP, BASIC, or any other program which, like LIST, uses the LST: device for output. When it sees one of these calls, UD intercepts it and takes over control of the printer (with UD0 options in effect).

UD, however, is not limited to being indirectly summoned by standard CP/M printer calls. If you prefer, it can be operated in the conventional printer-driver role; you can send your file to disk and then call UD to do the printing. For example:

```
UD B:USER.DOC
```

After you call UD and give it the drive and filename, hit <RETURN> and the program comes up. It first prints a series of questions; this built-in feature allows great user flexibility.

These prompts start with "UNIT NUMBER?". You type a unit number from zero to seven. When you press <RETURN>, the program prints "COPY COUNT". Usually, there is only a requirement for one, so you type "1". When you press <RETURN>, the program prints "STARTING TITLE". You type in the desired header, and press <RETURN>. Finally, the program prints "PAGE NUMBERS". As you type YES, you realize that the printer has already started printing your file; there is no need to press <RETURN>.

You must respond to the prompt for the UNIT NUMBER and COPY COUNT. But all the other prompts will be satisfied with a simple carriage return, if that will give the format you want to use for your printout.

Since UD.COM is basically a spooler, immediately upon receiving the instructions to print your file, it turns the console back to you. This enables you to perform without hindrance any other tasks that you might have planned.

You will happily notice that this spooler takes full control of coordinating both the console and file being printed. This driver performs your will without hesitation, quickly, and accurately, without the slightest argument. Except for SoftShop's HDOS spooler, UD.DVD, it is the only spooler that I have encountered that is a great delight to use. (UD.DVD is quite similar to UD.COM.)

Do I like it?

After using this program for several months, my conclusion is that it is a top-notch printer driver and spooler. It is easy and fun to use, and has a complete inventory of features.

In addition, this is the only CP/M-based spooler that provides full control of the left margin. If you have ever tried to punch three holes in a file that was printed with the LIST program, you will understand how important this single feature can be.

Bouquets to SoftShop on this program! With all due respects to Digital Research, SoftShop has created a delightful printer driver that does a lot to enhance CP/M. It has made life a lot easier for me.

Ordering Information

UD.COM (CP/M, CP/M-85), $39.95.
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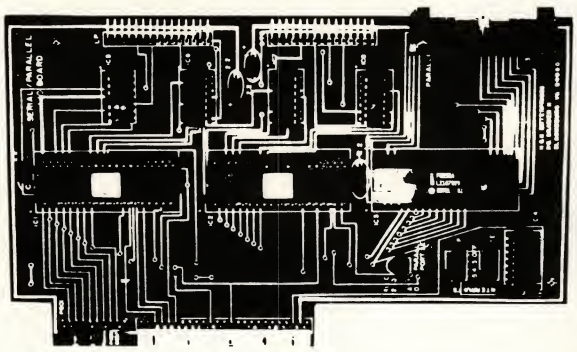

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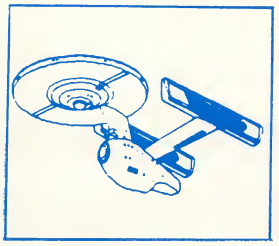

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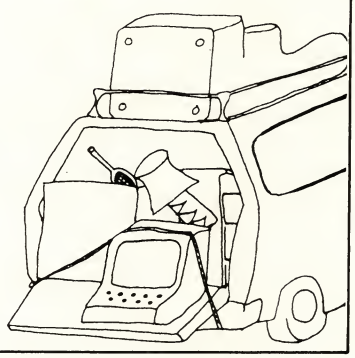

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OFFLIN: An Exercise in Z100 Assembly Language

To talk to the Z100's terminal, you need a program that sends the characters straight to the screen.

William S. Hall

One of the nice things about Heath/Zenith's H/Z19 terminal and the H/Z89 computer is the ability to take them off line. You can do so whenever you want to set a special feature—such as shifted-keypad or hold-screen mode. The Z100 does not have this facility.

Going off line allows you to talk to the terminal directly. When you put the '19 in reverse video, for example, you do so independently of anything coming from the computer. This is perhaps most evident when using the '19 as a free-standing terminal with the H8, but the '89 functions in the same way.

Going off line can be useful in a number of ways. You can silence the key click if you do not care for it. (Think about how many articles and letters have been written on *that* subject!) Or you can change the communication speed, enter reverse video, set the keypad to shifted or alternate mode, enter hold-screen mode, or execute numerous other terminal functions.

The '100 does not have an off-line capability because of the very way it was designed. The "terminal" is not separate from the computer, and the only way you can talk to it is through the machine itself.

Thus, there are two possible ways you might try to set a terminal attribute. You could type something at the prompt in the operating system, CP/M or the Zenith Disk Operating System (Z-DOS). Or you could run a program.

The first choice is not very practical. If you type in a control character—CTRL-A, say—Z-DOS will echo it back to the screen in the form ^A. The ^A is not really the character at all, but its two-character representation on the screen. A similar problem exists with ESCape characters. "ESC v" (needed to set wrap-around) is received by the terminal part of the '100 as "^[v"—which does not do a thing. And, of course, many control characters, such as CTRL-C or CTRL-P, are intercepted and used by Z-DOS itself.

CP/M-85, on the other hand, will echo back many control characters, including ESC. But, unfortunately, it converts lowercase letters to uppercase. Thus, you can clear the screen (almost) with "ESC E". But "ESC v" will be seen by the terminal as "ESC V", which does nothing on a Z100.

This leaves the program approach. To this end, I have written one in assembly language to allow setting and experimenting with the Z100 keyboard. It is written to run on the Z100's 16-bit side using the 8088 central-processor unit (CPU).

The program is called, appropriately, OFFLIN; it's given in Listing 1. It simply takes any character typed on the keyboard and repeats it back to the screen as if it came from a program.

Along the way, I learned a lot about writing assembly-language programs for the 8088. Because it can be more difficult than using an assembler based on the 8080 or Z80 CPU, I want to share what I have discovered with you—and perhaps ease your transition into using this very powerful, but often confusing, language.

Even if you do not know anything about assemblers, linkers, library managers, and system calls, you may want to stay along for the ride. The program is very short, and if you own Z-DOS version 1.1, then you have all the software needed to do what is required.

When you finish, you will know something about the heart of the machine. You will also have a simple program which is both educational and useful.

Unfortunately, if you have a newer version of the Z100's operating system, you may need to get some additional software. Z-DOS, of course, was Heath/Zenith's variant of version 1 of the Microsoft Disk Operating System (MS-DOS). Now version 2 is available. If you have only MS-DOS version 2, you will need to acquire the MACRO-86 assembler, MASM.EXE. Or you can use some other 8088 assembler which processes your source code to produce relocatable object code (.OBJ files).

You'll also be using the LINK program, which assigns memory addresses to the .OBJ code in order to produce a runnable version. LINK and the library manager are provided with version 2.

Using OFFLIN, you can explore many aspects of the Z100 keyboard in order to learn its numerous modes. The key click can be disabled by running OFFLIN, typing "ESC x 2" (without the spaces), and exiting. The 25th line can be enabled with "ESC x 1". The cursor can be moved with the sequence "ESC Y x y" (where x and y are characters whose ASCII values minus 31 represent the desired row and column numbers).

The block-graphics character set can be examined and more fully understood; reverse video can be set; and, if you are lucky enough to have color, foreground and background hues can be selected. The mysterious event-driven mode can be analyzed. OFFLIN, coupled with the key charts in Appendix B of the Z100 User's Manual, can teach you much about the Z100's screen-control functions.

Running OFFLIN

You will first have to assemble OFFLIN and produce an executable file. (This is discussed below.) After that, OFFLIN's operation is quite straightforward.

To use the program, enter OFFLIN from the Z-DOS command prompt. Then just type on the keyboard. All printing characters are sent to the terminal as typed. Control characters recognized by the terminal are acted upon.

Thus, a <RETURN> places the cursor on the left margin, and a <LINE FEED> advances to the next line. The sequence ESC A will move the cursor back one position, and ESC E will clear the screen. No attempt has been made to make any control character or escape sequence visible except by its actions. And those having no effect on the screen will do nothing.

Of course, some of these features are easier to enter than to leave. ESC } will disable the keyboard; CTRL-RESET is the only way out. OFFLIN will also allow you to enter the event-driven mode, where a key will give you one character string (a hexadecimal number) for the down

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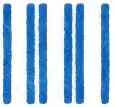

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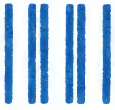

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Do you have questions about programming in Z-BASIC?

Ed Byrnes will answer your questions about Z-BASIC in a *Sextant* column, starting in the September-October issue.

Send your questions to:

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Z-BASIC Questions and Answers
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stroke and another for the return stroke. Although nice for game designers, this mode also must be exited with a reset. You may find other similar pitfalls where CTRL-RESET may be your only recovery—but that is what experimentation is all about.

There is one key that OFFLIN does not send to the screen, and that is the file separator or control-backslash (CTRL-\). When this character is typed, you exit the program.

Programming the 8088

OFFLIN is in assembly language. Although extremely simple, it was a bit of a challenge to write because of the difficulty of learning to use segmentation on the 8088.

On the other hand, interaction with the operating system can be simpler in Z-DOS than in CP/M. For example, you do not have to save or restore the register values when you call an operating-system service such as printing a character string to the console. (Still commonly called "system calls," as under CP/M, the Z-DOS terminology is "function call" or "function request." See Appendix I in the Z-DOS manual.)

Similarly, calls to Z-DOS's console-handling routines, especially the direct input to and output from the console needed in OFFLIN, are much easier to accomplish in Z-DOS than in the Heath Disk Operating System (HDOS).

In addition, using the software supplied with Z-DOS, it is quite easy to build a library of system calls with a minimum of effort. This library can then be used in other assembly-language programs. I shall show you how this is done—along with how to use the other program-development tools supplied by Heath/Zenith.

Along the way, I will try to explain a bit about the 8088 architecture, and how it affects assembler directives and the use of the linker. (Those of you for whom this is new don't need to panic. Follow the description of the program, reviewing sections if necessary. The documentation on MASM, LINK, and LIB in the Z-DOS manual may be helpful, and you can consult some of the references given at the end of the article.)

Segmentation

Before beginning with the program details, let's discuss a bit about segmentation. Segmentation is actually one of the 8088's (and 8086's) most powerful features—however much it may be derided in some quarters. (See, for instance, Rick Lutowski's article in *Sextant* #16, May-June 1985.)

A segment is simply any contiguous block of memory of up to 64K in length. A segment may be located anywhere in memory. It is addressed by a pair of 16-bit numbers, one of which is contained in a segment register, the other of which is an offset from the the base of the segment (the segment register). During program execution, the 8088 will obtain the physical location of a memory location in its possible one-megabyte memory space.

The 8088 obtains the physical location by shifting the segment-register value to the left four bits, and then adding to it the offset from the base of the segment. (The left shift is equivalent to adding a zero to the hex representation of the value in the segment register.)

For example, suppose the offset location of a byte in memory is 105C hex as measured from the data segment register containing 4921 hex. Then the physical address is

49210 + 105C = 4A26C
= 303,724 decimal

At any time, the 8088 can have up to four segments in use. These are usually called the code, stack, data, and extra segments.

When the 8088 is fetching an instruction, it always uses the code segment. A stack may be set up as a temporary buffer for holding values; an instruction to push a value onto the stack or pop one off it takes place in the stack segment. When the 8088 is looking for a variable, it usually looks in the data segment. Finally, the extra segment (or extra data

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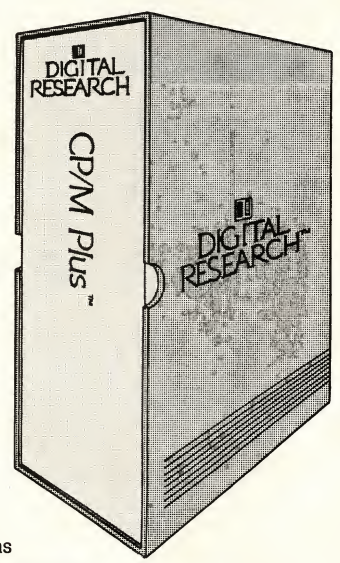

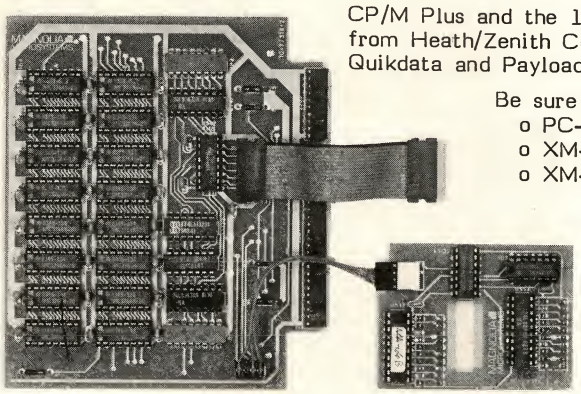

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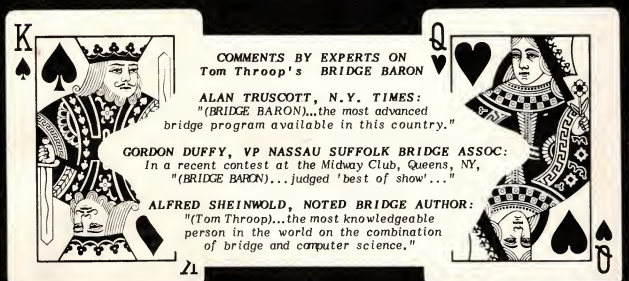

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APPOINTMENT CALENDAR
Version 2.1 for MSDOS/ZDOS
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APPOINTMENT CALENDAR is a ZBASIC program designed especially for the H/Z-100 computer. APPOINTMENT CALENDAR will let you create, store, edit, display, and print a calendar of important events and times for appointments, schedules, and special occasions. It directly supports the Epson MX, RX, and FX series of printers, the Heath H-14 and H-25, Diablo 630, and MPI 99/150 printers. Virtually any other dot matrix or letter quality printer is supported by a standard ASCII version of the calendar printout.

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```
        TITLE   OFFLIN - ECHO TERMINAL INPUT TO SCREEN

COMMENT *
        Written by William S. Hall
        Mathematical Reviews
        611 Church Street
        Ann Arbor, MI 48104

        Date written - 01/09/84
        Dates updated - 07/25/84, 08/30/84

        Usage: OFFLIN; type any sequence of characters; CTRL-\ to exit
                unless in event-driven mode, where a reboot is needed.
        *

        INCLUDE ASCII.H                 ; ascii character definitions
        INCLUDE SEGMACRO.MAC            ; segment defining macros

        SSEG    100                     ; make a stack of 100 hex bytes

        DSEG    PARA                    ; define a data segment
BANNER  DB      'Welcome to OFFLIN.  '  ; announcement
        DB      'Type CTRL-\ to exit.'
        DB      CC_CR, CC_LF, '$'
        ENDDS                           ; end the data segment

        PSEG    PARA                    ; define a code segment
MAIN    PROC    FAR                     ; called from z-dos, so far call
        EXTRN   DCONIN:NEAR             ; external subroutines
        EXTRN   CONOUT:NEAR
        EXTRN   OUTSTR:NEAR
START:
        PUSH    DS                      ; save for a return code
        MOV     AX,0                    ; complete the return address
        PUSH    AX                      ; now ready for system return
        MOV     AX,DGROUP               ; set up data segment
        MOV     DS,AX                   ; now cpu can find our data
        MOV     DX, OFFSET BANNER       ; point to message
        CALL    OUTSTR                  ; print it
LOOP:
        CALL    DCONIN                  ; see if character is at console
        CMP     AL,CC_NUL               ; no character if zero
        JZ      LOOP                    ; look again
        CMP     AL,CC_FS                ; use control-\ for exit
        JNZ     CONT                    ; no, so continue
        RET                             ; yes, return to system
CONT:   CALL    CONOUT                  ; echo it to terminal
        JMP     LOOP                    ; repeat the whole thing
MAIN    ENDP                            ; procedure end
        ENDPS                           ; end the code segment
        END     START                   ; starting address for system
```

Listing 1. OFFLIN.ASM, assembled together with the modules in Listings 2-7, will allow the user to input Z100 terminal-control codes from the keyboard and have them acted upon appropriately.

segment) is used as a destination for block moves and string operations, as well as for data.

Of course, there can be complications. Overrides can be employed so that the 8088 will look for data in the code segment, for example. Segments can overlap. In fact, code, stack, data, and extra segments can all be the same; this is sometimes called the 8080 model. Programs written in this way, when origined at memory address 100 (hexadecimal), are called .COM programs. This is just as they would be if written for CP/M and the 8080 CPU—a tribute to the influence of those two on the microcomputer world.

I could have, in fact, used the 8080 model for OFFLIN. The program would have been smaller, simpler, and much less interesting! But I found it much more instructive to write an .EXE program using a so-called small-memory model, having one code, one data, and one stack segment.

Besides, when multi-tasking operating systems become standard, the .EXE model will be mandatory. This is for the simple reason that you cannot have more than one task running if all programs want to execute in the same address space—as .COM programs must, "bound" to 100 hex.

By contrast, the .EXE model can be placed by the operating system wherever there is room for it to run. This is because the code is relocatable and is not bound to any particular memory location until it is loaded—unlike the case under CP/M. The binding, the setting of actual addresses, is simply a process of setting the values of the segment registers.

Contrast this with the greater effort required in MP/M-80 to load a .PRL (page-relocatable) program in memory. To complete the binding there, each byte in the program must be checked against a bit map at the end of the file in order to determine if relocation is necessary.

An .EXE program on the 8088 can have any number of segments. As already noted, however, only four can be active at any one time. Changing activity to another segment is done by placing a new value in the segment register—except for the code-segment (CS) register.

The value of the CS register can be changed only by jumping to, calling, or returning from another segment. (When it references another segment, it is called a FAR jump, call, or return. If a routine or program module references another routine or module in the *same* segment, that is a NEAR jump, call, or return.)

One of the great strengths of the 8088 is that several data segments can be maintained. It is then easy to write re-entrant and shared code—programs that can be stopped and later resumed at the same place without unintentionally stepping on another's data in the meantime. Re-entry is essential in multi-tasking, multi-user operating systems; shared code makes it possible for several users to run the same program from only one copy in memory.

However, except for very large programs or those referring to the video memory, intersegment transitions are seldom necessary. Most of the .EXE programs you are likely to write in assembly language need only one code, one stack, one data, and perhaps one extra segment. Even so, substantial programs can be written, since up to 64K of memory is available for each segment.

With this brief background, let us read through the program together to see how segments are defined by the programmer, and used by the assembler and linker. At the same time, I will explain several programming techniques as well as numerous assembler directives. Some system-call routines will be presented that you will easily be able to extend. Also, help on using MASM, LINK, and LIB will be provided.

Reading through the OFFLIN program

In Listing 1, OFFLIN begins with the assembler TITLE directive, to give a heading in the listing file. The title is followed by a comment where the programmer's name, file-creation and modification dates, and some limited documentation are given.

One-line comments are signalled in assembly languages by a semicolon. A comment of several lines, however, can be made by the assembler directive COMMENT. The next printing character

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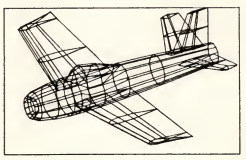

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Z-TOUR 1000 is an auto race 'card game' that simulates 'real life' driving situations. **Z-TOUR 1000** is a computer adaptation of the familiar Mille Borne card game. A full screen color display showing all cards and the playing board in vivid colors, quick speed, and complete implementation of all game rules, including COUP FOURRE and optional game extension make **Z-TOUR 1000** an interesting and fun game for adults and children.

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In order to proceed, you must have a green light. If you see a stop sign, you must stop. You must obey the speed limit signs. If you have an accident, you must have your car repaired. If you run out of gas, you must fill your tank. If you have a flat tire, you must install a spare tire. The card deck contains cards for all the hazards, remedies, and mileage. How well you do is based on the luck of the draw and the skill with which you play your hand against the computer.

Z-TOUR 1000 is a challenging, cerebral computer game. If you're tired of the fast-paced video arcade style games that tax your manual dexterity rather than your game playing skills, you'll enjoy **Z-TOUR 1000.**

Requires: H/Z100 computer with color video ram installed, a color monitor, ZDOS or MSDOS, and ZBASIC.

For Color Z-100: **$29.95**

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```
; Control characters

CC_NUL  EQU     0               ; null
CC_LF   EQU     10              ; line feed
CC_CR   EQU     13              ; carriage return
CC_FS   EQU     28              ; file separator
```

Listing 2. ASCII.H contains equates for the non-printing ASCII characters used in OFFLIN.

```
; Data segment

DSEG    MACRO   ALIGN
DGROUP  GROUP   DATA
DATA    SEGMENT ALIGN PUBLIC 'DATA'
        ASSUME  DS:DGROUP
        ENDM

; End data segment

ENDDS   MACRO
DATA    ENDS
        ENDM

; Code segment

PSEG    MACRO   ALIGN
PGROUP  GROUP   PROG
PROG    SEGMENT ALIGN PUBLIC 'PROG'
        ASSUME  CS:PGROUP
        ENDM

; End code segment

ENDPS   MACRO
PROG    ENDS
        ENDM

; Make a stack

SSEG    MACRO   NUM
STACK   SEGMENT PARA STACK 'STACK'
        DB      NUM&H DUP(?)
STACK   ENDS
        ENDM
```

Listing 3. SEGMACRO.MAC contains macros to define the beginnings, ends, and attributes of the segments used in OFFLIN.

after COMMENT is regarded by the assembler as the delimiter, and the comment must be closed with the same character again. In OFFLIN, the asterisk is used as the delimiter.

The next directive will INCLUDE ASCII.H (Listing 2) into the assembly as OFFLIN's header file. This is followed by SEGMACRO.MAC (Listing 3).

ASCII.H contains "equates" or symbolic names for the non-printing ASCII characters used in OFFLIN. A more general version would have definitions for all the control characters as well as for certain printing characters. Users of Z-DOS 1.1 can look at the file DEFASCII.ASM as an example. (Unfortunately, this file is not supplied in the standard issue of MS-DOS 2.1.)

The file SEGMACRO.MAC is simply a collection of macros. When one of them is invoked, it gives necessary information to the assembler about a segment. This provides a very convenient way to consistently define the beginnings, ends, and attributes (ALIGN, COMBINE, and CLASS, as discussed below) of the various kinds of segments used in OFFLIN.

By hiding these details here in SEGMACRO.MAC, the main program becomes a bit easier to read. Later, we shall examine in some detail what each macro call is doing; for the moment, we shall concentrate on its general effect.

A macro is just text which is assigned a name. Typically, the text is a set of program lines. The macro can have parameters which can be given specific values when the macro is called. The text itself can contain assembler directives and 8088 instructions. When the name is used in a program, the text defined by the macro is simply substituted in place of the name. A macro facility in a language can greatly ease the difficulty of programming and can ensure uniformity when, as here, you use several modules to create a program.

The very next line of OFFLIN, in fact, invokes the macro SSEG (stack segment) with the parameter 100. This defines a stack segment of 256 bytes (100 hexadecimal) in memory. When a system call is made, up to 128 of these bytes (80 hex) might be used by the operating system, Z-DOS. The rest are for us, although they will hardly be needed for such a simple program.

In the next line, the DSEG (data segment) macro with the parameter PARA defines the start of the data segment. In OFFLIN, the only data is a string which announces our entry into the program. The parameter PARA simply defines the alignment, the type of address boundary for the start of the segment. In this case, the segment starts on a paragraph boundary: an address whose low-order four bits are zero. This will be the first, and only, data segment in the program; therefore, we have asked the linker to load this segment beginning on a paragraph boundary. (Hidden in the macro file are other details to be discussed later.) The macro ENDDS (end data segment) marks the end of this segment.

The macro PSEG (program segment), with the same type of alignment, PARA, starts the code segment. It is followed by a procedure called MAIN. This contains part of the code for the program, as well as calls to three subroutines, DCONIN, CONOUT, and OUTSTR. (See Listings 4, 5, and 6.)

We are going to assemble those three subroutines and OFFLIN in separate modules. Therefore, the assembler needs to know that they are external to OFFLIN. The EXTRN directive is used for this purpose.

Again, in such a small program, it would be nearly as easy simply to code them into the main program. However, these routines have universal application and can be used whenever these system services are needed. So I have written them once and for all to be placed in a library where they can be fetched by the linker.

Note that each of these three subroutines is a NEAR procedure. This

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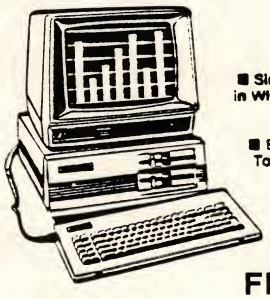

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BOXES & SWITCHES
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BOXES
Copyright 1985 by Terry Wilk
Produced by Newline Software

BOXES is a pixel graphics game program for the Z-100 with or without the color option. Perhaps you know the game by other names such as "Dots" or "Dot-to-Dot". It is a game of both skill and chance. You can play against another person or the computer. Briefly, the game is composed of a grid of dots. Each player completes a turn by drawing a line between two adjacent dots, with the intent of completing a box or making a move that does not allow your opponent to complete a box on his turn. Whenever you complete a box, it is marked as your's and you get another turn. The object of the game is to create more boxes than your opponent. **BOXES** is designed to be easy to learn and operate for game players of any age.

SWITCHES
Copyright 1985 by Terry Wilk
Produced by Newline Software

SWITCHES is an original pixel graphics puzzle program. The puzzle is composed of different rectangular parts. **SWITCHES** starts off with all parts set to one color called the "original color". The object of **SWITCHES** is to switch all of the puzzle parts from the original color to another color called the "switch color". You do that by selecting one rectangular part to switch to the opposite color. You can switch any part's color any number of times and in any sequence you like. However, the catch and the challenge is that in switching a part's color all adjoining parts will also switch color. The problem is in figuring the sequence of switches to solve the puzzle. You can try to solve the puzzle yourself, or watch the computer try to solve it. The number of puzzles is virtually limitless! This one will really get you thinking.

Program Requirements:

H/Z100 Computer with Z-DOS or MS-DOS 2.0, 128K of memory minimum, one or more disk drives, Color (optional). A Printer is optional for the SWITCH program. Both BOXES and SWITCHES are included.

BOXES & SWITCHES $29.95

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```
        NAME    CONOUT

;       entry - (al) = character to be sent to terminal
;       exit - none

        INCLUDE DOSIFUNC.H
        INCLUDE SEGMACRO.MAC

        PSEG    BYTE
        PUBLIC  CONOUT
CONOUT  PROC    NEAR
        MOV     AH,DOSF_CONOUT
        MOV     DL,AL
        INT     DOSI_FUNC
        RET
CONOUT  ENDP
        ENDPS
        END
```

Listing 4. CONOUT.ASM is the source code for the module which echoes a character back to the screen. It accepts the system-call number and the character to be displayed, and performs the interrupt to execute the system call.

```
        NAME    DCONIN

;       entry - none
;       exit -  (al) = 0 nul if no character ready, otherwise
;               (al) = character read.

        INCLUDE DOSIFUNC.H    ; defines system calls
        INCLUDE SEGMACRO.MAC  ; segment macros

        PSEG    BYTE          ; begin code segment
        PUBLIC  DCONIN        ; available to other programs
DCONIN  PROC    NEAR          ; called from same segment
        MOV     AH,DOSF_DRCIO ; function number
        MOV     DL,0FFH       ; indicates char read operation
        INT     DOSI_FUNC     ; do it
        RET
DCONIN  ENDP
        ENDPS                 ; end code segment
        END
```

Listing 5. DCONIN.ASM is the source code for the module which checks the console to see if a character has been typed.

```
        NAME    OUTSTR

;       entry - (dx) = offset pointer to string
;       exit - none

        INCLUDE DOSIFUNC.H
        INCLUDE SEGMACRO.MAC

        PSEG    BYTE
        PUBLIC  OUTSTR
OUTSTR  PROC    NEAR
        MOV     AH,DOSF_OUTSTR
        INT     DOSI_FUNC
        RET
OUTSTR  ENDP
        ENDPS
        END
```

Listing 6. OUTSTR.ASM is the source code for the module which prints a character string to the screen. It accepts a pointer to the string and prints it.

means that the assembler will generate a call and return which do not reference a segment register as well. Consequently, it is necessary to ensure that these external routines are in the same segment as the main program. The PSEG macro takes care of the bookkeeping, as we shall see.

MAIN itself is a far procedure. Remember we said that the code segment can only be changed by a far jump or far call. When Z-DOS is waiting at the prompt, a part of Z-DOS called the executive is running in its own code segment. When you run a program, the executive loads it into memory. The executive then starts the program by making a far jump from its own segment to the beginning of yours.

OFFLIN's starting address, an offset from the base of the code segment, is indicated by the label which follows on the very last line after the END statement. The starting address of the code segment is determined by Z-DOS; it depends on the location and size of the operating system, other programs which may be resident, etc.

Exiting gracefully

Now we get to a really interesting part of the code and one of the more difficult items to understand. After a program has finished, it needs a way to get back to the executive.

Upon entry to a program, Z-DOS places the same segment address in both the data-segment (DS) and extra-segment (ES) registers. Also, at a zero offset from that segment, it places an instruction whose execution will cause a graceful return to the operating system.

By pushing this segment address and an offset of zero onto the stack, the MAIN portion of the code, which is a far procedure, can get back to Z-DOS by executing a (far) return. This is the purpose of the few lines of code after the label START.

First, the value in the DS register is saved on the stack with PUSH DS. Then an offset of zero is placed on the stack by the next two instructions. When the return in MAIN is executed, the offset value (0000) at the top of the stack goes into the 8088's instruction pointer (comparable to the 8080's program counter). The next value is then placed into the CS register, and the CPU starts executing what it sees at this new address. What it finds is an interrupt 20 hex, which is the system call to return to Z-DOS.

It is important to note that simply executing an interrupt 20H in the middle of a program will not stop the program properly. The CS register must also contain the value that the DS and ES registers were given by Z-DOS when the program started. Moreover, the only way to change the CS register is with a far jump or far call. What we have just

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```
; Define the interrupts

DOSI_FUNC       EQU     21H     ; perform a function

; Define the function numbers

DOSF_CONOUT     EQU  2          ; console output
DOSF_DRCIO      EQU  6          ; direct console i/o
DOSF_OUTSTR     EQU  9          ; output string
```

Listing 7. DOSIFUNC.H defines the symbolic names of the system calls used in OFFLIN.

described is the far-call way of returning to Z-DOS. (The far jump is used in the sample .EXE program in Appendix P of the Z-DOS manual for version 1. You may find the program a bit cryptic, however.)

Next, the DS register must be set up so the program can find the data segment. In our program, any data segments we may have are placed together in a region called DGROUP, which is defined in the DSEG macro. If we put the base address of DGROUP into the DS register, then that segment is properly initialized for the program.

After the DS register is set, the next instruction loads the address of the beginning of the banner string. Then the subroutine OUTSTR (outstring: output a string from the CPU) is called to print it on the console. Note the use of the word OFFSET. If not used, the *contents* of BANNER rather than its *location* will end up in register DX. At this point, we begin the main program loop.

The program is now very simple. First, the console is checked for a character with the routine named DCONIN (direct console input to the CPU). We use the direct mode since we do not want the operating system to catch control characters. If DCONIN returns "00" in register AL, it means that no character is ready; otherwise the character itself is returned in AL. The call is repeated until the CMP (compare) instruction produces a non-zero result.

The character obtained is then compared to the file-separator character

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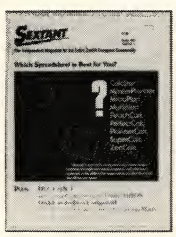

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CTRL-\. If this has been typed, the return instruction takes us back to the operating system. Otherwise, a simple console-output call is made via CONOUT and the character is sent back to the video display. A jump back to the top of the loop begins the sequence again. An END PROCEDURE statement terminates the main procedure, and segment and program end statements finish the listing.

External modules

OFFLIN calls three services: direct console input (direct input to the CPU from the console; see Listing 4), console output (output from the CPU to the console; see Listing 5), and print (output) a string to the console (see Listing 6). They are quite similar; let us look at Listing 4, DCONIN.

After the NAME directive, the name DCONIN is assigned. When using LIB, it is helpful to have a *name* for a module, as distinct from a *title*. As noted above, the TITLE directive simply includes a heading in the .LST file. A NAME directive is actually recognized by the library manager. I use NAME directives in subroutines which will go into library files. Otherwise, you may not know which module is which in your library.

Next are some remarks about entry and exit; i.e., what you as a user must do before you call the routine, and what to expect when it returns. In DCONIN, there is no special entry—no values have to be placed in any register for DCONIN to be called; everything is done in the module itself. It returns with the character if one is ready; otherwise a null indicates a character has not yet been seen.

Next, we INCLUDE two files. We have already mentioned the segment macro file. Listing 7 shows the contents of DOSIFUNC.H. This simply gives numeric values to the symbolic names, equating them with the values of the system calls we use.

A more complete file, DEFMS.ASM, is included with Z-DOS 1.1. If you own only MS-DOS 2.1, you will not have this file. Of course, you do not have to use these symbolic names but only their values. However, it is a better programming practice to use the names.

Again we use the PSEG macro, but this time with a BYTE alignment: this allows the segment used in this module to be placed starting on any byte in memory. In particular, PSEG contains the information needed to ensure that all code segments we use in the program will be placed together. Therefore, the BYTE parameter allows this module to start at the next free byte when various code segments are loaded by the linker. We thereby ensure that no code space is wasted. This may become a bit clearer when we discuss SEGMACRO.MAC in

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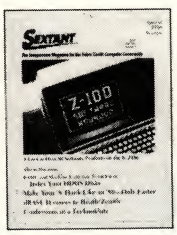

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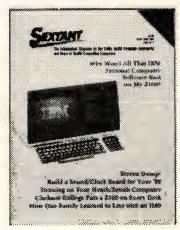

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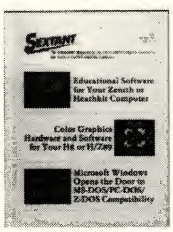

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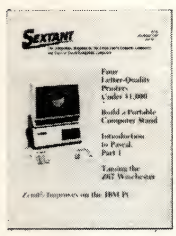

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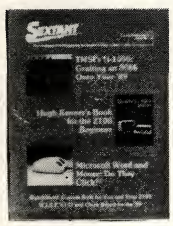

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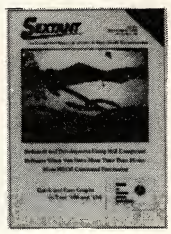

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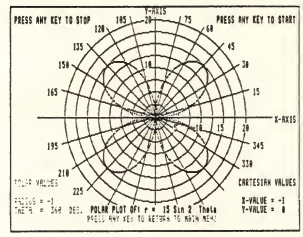

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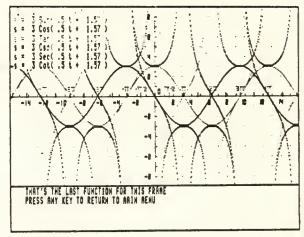

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more detail.

The PUBLIC directive declares that DCONIN is available to other programs. DCONIN itself is a NEAR procedure, which means it is accessed by its caller via a near call. Again, the assumption is that this module is loaded in the same segment as its caller; and again, this is assured by PSEG.

Next follows the actual coding, which is quite simple. It follows the typical pattern of system calls in Z-DOS 1.1. MS-DOS 2 has the same system calls, plus a second set which are more like those used in the Unix operating system.

The ones we'll use in OFFLIN are the CP/M-like calls, numbers 1 to 36. These require the system-call number to be placed in register AH. Any parameters are usually placed in registers DL or DX. For DCONIN, we place 0FF hex into DL to indicate a console-read operation. Then a software interrupt DOSI_FUNC (interrupt 21H—perform a function) is executed and the routine returns with its result for the main program.

You may ask why we did not use a simpler console-input call. In fact, there are several such calls. Most, however, do some interpretation of the input—such as checking for CTRL-C to exit, CTRL-P to turn on the printer, etc. However, DCONIN does no editing of the input, which is as we want it for OFFLIN.

The other two modules are similar to DCONIN in structure. Thus, CONOUT accepts the call number in AH, the character to be displayed in DL, and performs an interrupt (21H).

Similarly, OUTSTR accepts a pointer in DX to the string to be printed. (The string must be terminated with a $, by the way.) If you have Z-DOS 1.1, you can find a description of the system calls and how to use them in Appendix I to the Z-DOS manual.

Assembling and linking OFFLIN

After you have typed all the programs and the INCLUDE files, you can attempt to assemble them. For the main program, the assembly command is:

MASM OFFLIN,OFFLIN,OFFLIN,NUL

This means: run the assembler MASM with a source file OFFLIN.ASM, to produce an object file OFFLIN.OBJ, a listing file OFFLIN.LST, and no cross-reference file. The listing file is really not necessary. But you might find it interesting to see the various macros expanded and the actual values of all the registers given (to the extent they can be generated). You can learn a lot by studying a listing file.

Next, use the command

MASM DCONIN;

to get .OBJ files for the external subroutine DCONIN; repeat for CONOUT and OUTSTR. The ";" tells MASM to use its defaults, so no listing or cross-reference files will be generated.

Next, we can place the object files for the three subroutines into a library. Later, whenever they are needed by a program, the library can be searched, and the needed modules extracted by the linker.

Run LIB; at the first question, you can give your library a name: say, DOSFUNCT (Z-DOS functions). It will automatically get an extension of .LIB. Since DOSFUNCT.LIB does not yet exist, MASM will ask you whether to create it. Answer "yes" and then perform the operation

+CONOUT+DCONIN+OUTSTR

This will assign the three modules to the library. Finally, you will be asked for a listing file. Call it DOSFUNCT.LST. In it, you will be able to see details about the library.

LIB can perform many more functions, such as removing a module. It can also check for integrity, to see that there is a valid library, that there are no conflicts, etc. See the Z-DOS documentation for details.

Finally, we can link these files together to get an executable program. The command line is

LINK OFFLIN,OFFLIN,OFFLIN/M,DOSFUNCT

The linker will process OFFLIN.OBJ to produce the file OFFLIN.EXE and create a map file, OFFLIN.MAP, to list all global symbols defined in OFFLIN. And it will

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search the library DOSFUNCT.LIB for any needed routine referenced as external.

You can now run OFFLIN as we have already described. The .MAP file is not really necessary, but it does show you how the modules and segments were loaded by LINK, as well as showing the points at which the program expects to be entered.

I should mention that, in practice, you would test your program and new library routines before placing them in an actual library file. Suppose, for example, you have already been satisfied with CONOUT and DCONIN and put them into the library. Now, you want to test OUTSTR.

After assembly, the link line

```
LINK OFFLIN+OUTSTR,OFFLIN,
  OFFLIN/M,DOSFUNCT
```

will link the .OBJ files OFFLIN and OUTSTR to produce OFFLIN.EXE and OFFLIN.MAP; it will search DOSFUNCT.LIB. (The command line, of course, will not be broken as it is above.) You can then run OFFLIN.EXE. If you are satisfied with it, you can then add OUTSTR to the library. LIB is very easy to use and is a valuable development tool.

The segment macro file

We can conclude our discussion of OFFLIN with an examination of SEGMACRO.MAC (Listing 3). It contains five macros. The first two open and close a data segment, the next two a code segment, and the last establishes a stack segment.

Let us look at PSEG. Note that the first line states that PSEG is a macro and that it takes an ALIGN (alignment) parameter.

The next line begins the macro itself with the GROUP assembler directive. It says that the segment which follows, whose name is PROG, is a part of the group which we call PGROUP (program group).

At this point, it may help to know that a group is a collection of segments which is not more than 64K in length. Our program has several code segments: the one in OFFLIN itself, as well as the ones in the external modules. By placing each into the group called PGROUP, we are assured that all its members can be addressed by a single segment register.

The next line gives the name of the segment PROG, and defines the segment as to its ALIGN, COMBINE, and CLASS.

In PSEG, the alignment is a parameter in the macro. I have used PARA (paragraph) in the main program and BYTE in the modules. Other possibilities are WORD and PAGE.

The combine is PUBLIC; therefore, segments are loaded one after another, subject to any restrictions from the align parameter.

The class is also PROG. A class is simply a collection of groups, and segments with the same name and class name are loaded together. In a program this small, only one class is needed.

A good explanation of the options and the loading details is given in the Z-DOS documentation for LINK. Nevertheless, it can be confusing; the macros presented here can be a help toward using the LINK options in programs.

The PSEG macro ends with an ASSUME directive. This tells the assembler to assume that the code segment is referenced as an offset from PGROUP.

The DSEG macro is very similar to PSEG. And the macros ENDDS and ENDPS simply end the data and code segments, respectively.

Finally, the SSEG macro specifies a stack segment. The parameter NUM specifies the number of bytes to be used for the stack segment. Note the use of & to concatenate whatever value of NUM is specified with H, so that the size will be in hex. The combine parameter STACK is the same as PUBLIC in the data segment—except that in this case the stack pointer is set to the top of the segment.

Conclusion

Despite its apparent simplicity, OFFLIN has a hidden complexity mainly concerned with using segmentation in the 8088. I hope I have not further clouded the issue and that I have provided you with files and models you can use to facilitate your entry into using assembly language. And, finally, I hope OFFLIN itself will help you to learn about the Z100 screen and how to use it in your own programs.

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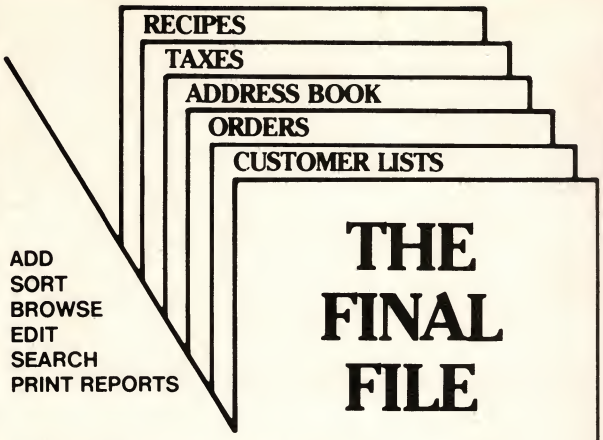

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Making Z-BASIC More Colorful

By mixing "stripes" of color, you can create over a hundred variations.

Sidney Hack

Zenith gives you eight colors for your H/Z100. But you don't have to be satisfied with them. You can have many more colors in your BASIC programs. And you can do some wonderful things when you know how to use the many shades that can be programmed in Z-BASIC.

I'll show how you can combine the eight basic colors to yield 36, 148, or more colors. Then I'll explain two programs that generate random artwork; the artwork can be adjusted to reflect your preferences for content, size, and color.

But first, a few words about how different colors are produced.

How color monitors work

Color monitors have the capability of illuminating red, green, and blue points on the screen. A grouping of one red, one green, and one blue *point* is called a picture element, a *pixel*. When we illuminate two or three points in a pixel, the light they produce will mix to produce still more colors for the pixel as a whole. Red and green, for instance, produce yellow.

If the intensity of individual points could be varied, as in a color television set, an almost infinite variety of colors could be displayed. In Z-BASIC for H/Z100 systems, however, we have only the ability to illuminate pixels in a choice of eight colors of full intensity; or, through POKE routines, to fully illuminate individual points. (I know of no way to vary the intensity of individual points in Z-BASIC—if anyone does, I'd really like to learn about it.)

So, we are somewhat limited as to how many different colors can actually be produced by software. There are ways around the limitations, however.

Colors in Z-BASIC

Z-BASIC gives us colors 0 through 7: 0 is black (no points lit); 1 is blue; 2 is green; 3 is cyan (blue and green points lit); 4 is red; 5 is magenta (blue and red points lit); 6 is yellow (red and green points lit); and 7 is white (blue, green, and red points lit).

These eight basic colors are easily programmed. For example:

```
LINE(0,122)-(639,122),5
```

will produce a horizontal magenta line clear across the center of the screen. (In all that follows, remember that the video screen is a matrix of 640 by 225 pixels. Horizontal coordinates are 0 to 639; vertical coordinates are 0 to 224. The upper left is 0,0.)

To produce this magenta line, Z-BASIC illuminates the red and blue points between the two endpoints specified in the parentheses. Changing the number after the last comma would produce a different combination of lit points. For example,

```
LINE(0,122)-(639,122),7
```

```
10 CLS
20 FOR C=7 TO 0 STEP -1
30 FOR D=C TO 0 STEP -1
40 FOR X=X TO X+103 STEP 2
50 LINE(X,Y)-(X,Y+35),C
60 LINE(X+1,Y)-(X+1,Y+35),D
70 NEXT X:X=X+2
80 IF X>630 THEN Y=Y+37:X=0
90 NEXT D:NEXT C
```

Listing 1. Pairing colored vertical lines on the screen produces a 36-block grid of colors. (See Figure 1.)

```
10 CLS
20 FOR C=0 TO 7
30 FOR D=C TO 0 STEP -1
40 FOR E=0 TO D
50 FOR X=X TO X+50 STEP 3
60 LINE(X,Y)-(X,Y+15),C
70 LINE(X+1,Y)-(X+1,Y+15),D
80 LINE(X+2,Y)-(X+2,Y+15),E
90 NEXT X:X=X+2
100 IF X>630 THEN Y=Y+17:X=0
110 NEXT E:NEXT D:NEXT C
120 X=0
130 FOR C=7 TO 0 STEP -1
140 FOR D=C-1 TO 0 STEP -1
150 FOR X=X TO X+50 STEP 2
160 LINE(X,Y)-(X,Y+15),C
170 LINE(X+1,Y)-(X+1,Y+15),D
180 NEXT X:X=X+1
190 IF X>630 THEN Y=Y+17:X=0
200 NEXT D:NEXT C
```

Listing 2. This Z-BASIC program combines sets of three vertical lines to produce even more colors.

would result in a white line (red, green, and blue points lit).

Another way

There are other ways to put colored lines on the screen. You could program in machine language or assembly language. In Z-BASIC, you can POKE appropriate values into the video color memory that controls a given line. A particular number will light the individual points according to a desired pattern.

I've experimented a good bit with that approach; but I don't use it much because it is fairly complex and unwieldy. But here's a method of generating the same magenta line using POKEs:

```
10 DEF SEG=&HC000:FOR C=&H6200 TO
&H6250:POKE C,255:NEXT
20 DEF SEG=&HD000:FOR C=&H6200 TO
&H6250:POKE C,255:NEXT
```

Line 10 produces a blue line by turning on all the blue points in 80 columns. Line 20 turns on the red points.

For those interested in pursuing this method, I'll add a short additional explanation: DEF SEG=<ADDRESS> establishes the current value to be used by a POKE. The value C000 is the hexadecimal (&H) address of the start of the segment of video memory that controls the blue points. Note that the only difference betweeen the two lines is the hexadecimal designation of the video memory segments. In these cases, the green segment (&HE000) is not addressed.

The points lit are those between hexadecimal 6200 and 6250. &H6200 is the hex address of the column at the center of the left edge of the screen. The value of &H6250 is 80 (decimal) greater than the value of &H6200. So each loop consists of 80 cycles.

The value you POKE into each successive location controls the illumination of the points in the portion of the color segment being addressed. The particular number will determine the pattern in which the points are illuminated. (Without getting into binary equivalents of decimal numbers, I'll merely state that changing 255 to 170 or to 85 will cause every other point to be illuminated. POKEing other positive numbers between 0 and 255 yields different patterns for the line.)

I can't leave the POKE method without stating that there are fascinating possibilities to generate different colors and shapes; but going into details is beyond the scope of this article.

To get more colors

I said that we can get more than the eight colors Zenith gives us. The method I use is to alternate colors of adjacent vertical lines. This will produce different colors by much the same principle that is at work when we light adjacent points in a pixel.

Why vertical lines? Vertical lines work much better than horizontal lines. To understand the reason for that, consider that pixels are closer together horizontally than they are vertically. This means that differently colored vertical lines blend into each other better than horizontal lines do. Accordingly, shades created by using vertical lines are quite uniform in color; different adjacent horizontal lines, however, clearly show the distinct colors in which they are drawn. (That's the case unless you know about interlacing and have a long-persistence screen, which we're not going to get into here.)

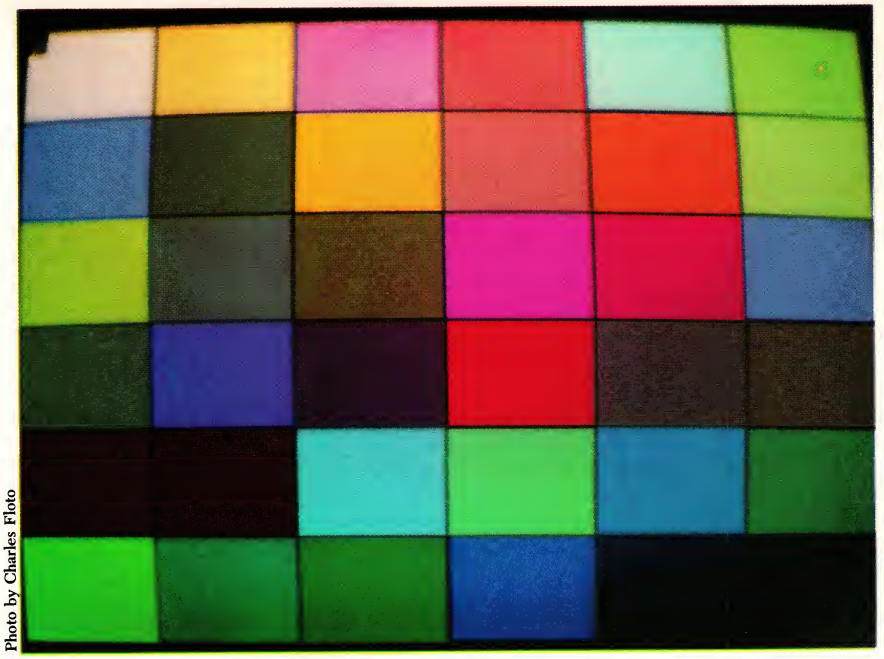

Photo by Charles Floto

Figure 1. The grid of colors produced by Listing 1.

The short program in Listing 1 will fill your screen with 36 color blocks from white in the upper left to black in the lower right. (See Figure 1.) A few words of explanation will be helpful in understanding the program and using the variety of colors in your own programs.

The program in Listing 1 consists of two loops that change the values of the variables C and D. C and D, in turn, determine which two Z-BASIC colors will be alternately drawn in short adjacent vertical lines. Note that I wrote it so that D cannot have a value greater than C—this avoids the possibility of duplicating color effects.

The rest of the program is concerned with actually drawing the lines in colors C and D and formatting the color patterns on the screen.

More colors

If you really like a lot of colors, try the program in Listing 2. It yields the 36 colors of Listing 1, and 100 more.

The important difference between the two programs is that in Listing 2, *three* colored lines are cycled in the first part of the program (up to line 110). The second part of the program creates more colors by adding those two-line colors that do not duplicate any of the colors in the first part of the program.

There's a penalty to pay in getting more than 36 colors. You'll notice that the colors produced by three different adjacent lines are not as clean as those produced by two lines. Nevertheless, I do believe the process can be useful if you like to work with many colors. If you do, you might go further by programming sets of four colors in successive vertical lines—you can get hundreds of variations.

When I first wrote the program, I did a considerable amount of calculation to try to decide how many unique shades were actually produced. I concluded that there were actually 136, but I'm still not sure, because even colors that look very similar are not quite the same.

What to do with all those colors

All of the foregoing has dealt with generating colors. But what to do with them?

How about some random artwork with

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```
0.00  2235 1SEP 57 -->25
```

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random colors? The program in Listing 3 produces some spectacular rectangular images that you can alter to your heart's content. Figure 2 shows the results of a run.

Based on your entries, specific repeatable patterns are generated by the program. You can vary the background, border, and image colors; the size of rectangles; and the extent to which the screen is filled. The program is menu-driven and not difficult to use. A few features do require some explanation, however.

When you first run the program in Listing 3, you enter a series of inputs as indicated by successive menu items. You specify a number as a seed for the random generator. You choose one of eight colors for the border of the painting. (0 is black, or no border; 1 is blue; etc.) And you select the color you want for the screen background.

You also choose colors for the random rectangles to be generated. Here you can program balanced colors, where each of Z-BASIC's eight colors has an equal probability of participating in the formation of rectangles. Or you can delete some colors while weighting the probability for others as you wish.

There's a maximum starting size to be set for the first rectangle—up to one-quarter of the screen; and you set the ending maximum size of rectangles. And finally you choose the decay rate, or how fast rectangles become smaller.

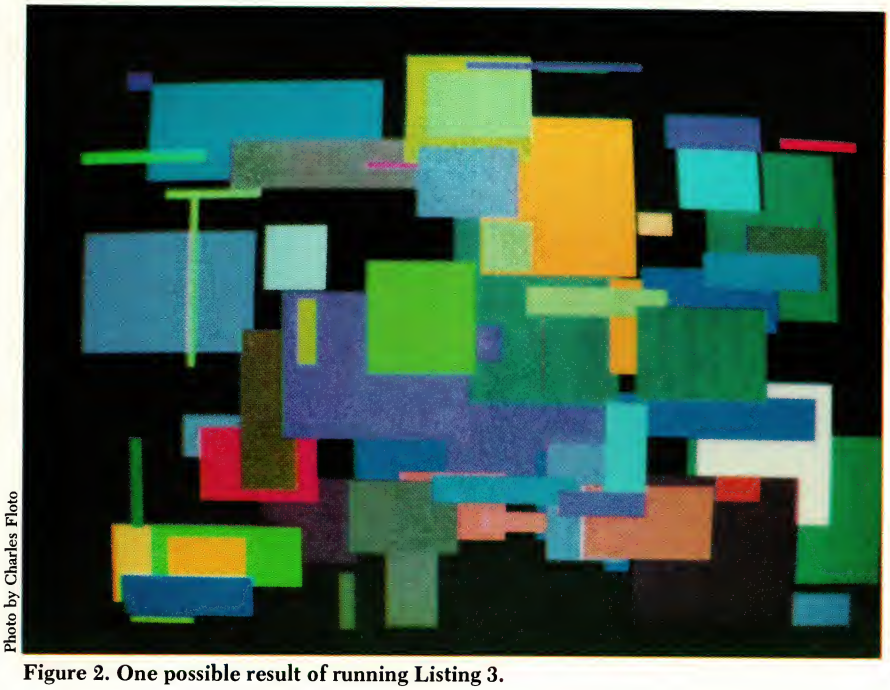

Photo by Charles Floto

Figure 2. One possible result of running Listing 3.

Then the program begins painting. If you do not interrupt it, the program will run to completion; your "painting" will then sit on the screen awaiting a "Q" (Quit) keystroke if you want to erase it. A "C" (Continue) will erase the screen and give you an opportunity to alter the picture by entering new values for one or more variables.

You can also suspend the painting at any point by hitting "S". (Striking any key will resume operation.) In this case, a rectangle in progress will be completed before the interrupt takes effect. You might use this feature when you want to study a painting as it progresses; or you might want to photograph a

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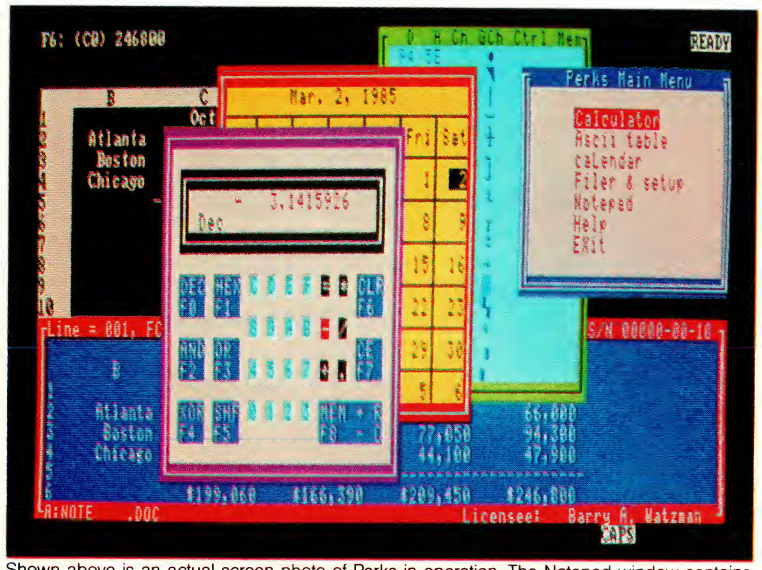

Shown above is an actual screen photo of Perks in operation. The Notepad window contains data "Imported" from the Lotus 1-2-3 worksheet being prepared when Perks was activated.

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```
10 CLS:LOCATE 10,1
20 INPUT"ENTER SEED: ",S
30 RANDOMIZE S
40 CLS:DD=90
50 D=INT(DD*RND):A=RND*.875:F=INT(RND*8):G=INT(RND*8):
   H=INT(500*RND+50):V=INT(175*RND+25)
60 FOR X=0 TO D STEP 2
70 Y=SQR(D*D-X*X):IF FLG=1 AND ABS(YY-Y)>1 THEN Y=Y-1
80 Y=A*Y:IF Y<1 THEN 140
90 LINE(H+X,V+Y)-(H+X,V-Y),F
100 LINE(H-X,V-Y)-(H-X,V+Y),F
110 LINE(H+1+X,V+Y)-(H+1+X,V-Y),G
120 LINE(H+1-X,V-Y)-(H+1-X,V+Y),G
130 YY=Y:IF FLG=0 THEN FLG=1
140 NEXT:DD=DD*.98:IF DD<20 THEN END
150 GOTO 50
```

Listing 3. This program will produce a random series of colored rectangles on the screen. (See Figure 2.) A number of its parameters are user selectable. Long lines are broken here for convenience in printing. They can be input as one line if your editor can create lines longer than the width of the screen. Under Z-BASIC, a logical line can be extended to more than one physical line by using the line-feed key (CTRL-J).

```
10 CLS:LOCATE,,1:A$(0)="BLACK":A$(1)="BLUE":A$(2)="GREEN":
   A$(3)="CYAN":A$(4)="RED":A$(5)="MAGENTA":A$(6)="YELLOW":
   A$(7)="WHITE":IF FLG=0 THEN 30
20 PRINT"SEED:    ";S:FOR C=0 TO 7:PRINT A$(C);":";TAB(9) C(C):
   NEXT:PRINT"BACKGROUND: ";A$(BK);"    BORDER: ";A$(BORD);"    MAX:
   ";MAX;"    MIN:";MIN;"    DECAY:";DECAY:PRINT
30 PRINT"ENTER SEED FOR RANDOM GENERATOR";:
   IF FLG=1 THEN PRINT" (RETURN OR ZERO REPEATS SEED): "; ELSE PRINT": ";
40 INPUT"",S:IF S=0 THEN IF FLG=0 THEN S=0:LOCATE 1,33:
   PRINT S ELSE S=SEED:LOCATE 12,63:PRINT S
50 INPUT"ENTER BACKGROUND COLOR (RETURN FOR BLACK BACKGROUND): ",BK
60 IF FLG=0 THEN LOCATE 2,55:PRINT A$(BK) ELSE LOCATE 13,55:PRINT A$(BK)
70 SEED=S:DUMMY=RND(-ABS(S)):PRINT"RETURN FOR ";
80 IF FLG=0 THEN PRINT"BALANCED ";ELSE PRINT"THE SAME ";
90 PRINT"COLOR WEIGHTS, ANY OTHER KEY TO CHANGE COLOR WEIGHTS: ";
100 X$=INPUT$(1):IF X$="" THEN 100
110 IF X$=CHR$(13) THEN IF FLG=0 THEN FOR C=0 TO 7:A(C)=1:NEXT:PRINT"BAL":
    GOTO 140 ELSE FOR C=0 TO 7:A(C)=C(C):NEXT:PRINT"SAME":GOTO 140
120 PRINT"ENTER ZERO OR GREATER TO WEIGHT COLORS (RETURN=ZERO WEIGHT)"
130 FOR C=0 TO 7:PRINT TAB(7)"FOR ";A$(C);:INPUT ": ",A(C):A(C)=ABS(A(C)):NEXT
140 PRINT"SELECT BORDER COLOR, 0-7 (0=NO BORDER; RETURN=";:
    IF FLG=0 THEN PRINT"WHITE): "; ELSE PRINT A$(BORD);"): ";
150 X$=INPUT$(1):IF X$="" THEN 150
160 IF X$<>CHR$(13) THEN BORD=VAL(X$) ELSE IF FLG=0 THEN BORD=7
170 PRINT A$(BORD):FOR C=0 TO 7:C(C)=A(C):NEXT
180 FOR C=1 TO 7:A(C)=A(C)+A(C-1):NEXT
190 PRINT"ENTER STARTING SIZE (320 IS MAX, RETURN=";:
    IF FLG=0 THEN PRINT "200): "; ELSE PRINT MAX;"): ";
200 LINE INPUT;X$:IF VAL(X$)=0 THEN IF FLG=0 THEN I=200:
    PRINT I ELSE I=MAX:PRINT I ELSE I=VAL(X$):PRINT
210 MAX=I:PRINT"ENTER ENDING SIZE (RETURN=";:
    IF FLG=0 THEN PRINT "40): "; ELSE PRINT MIN;"): ";
220 LINE INPUT;X$:IF VAL(X$)=0 THEN IF FLG=0 THEN MIN=40:
    PRINT MIN ELSE PRINT MIN ELSE MIN=VAL(X$):PRINT
230 PRINT"DECAY RATE (RETURN=";:
    IF FLG=0 THEN PRINT "2.25): "; ELSE PRINT DECAY;"): ";
240 LINE INPUT;X$:IF VAL(X$)=0 THEN IF FLG=0 THEN DECAY=2.25:
    PRINT DECAY ELSE PRINT DECAY ELSE DECAY=VAL(X$):PRINT
250 PRINT:PRINT"PRESS ANY KEY TO BEGIN PAINTING: ";
260 X$=INPUT$(1):IF X$="" THEN 260
270 COLOR 0,BK:CLS:LOCATE,,0
280 LINE(0,0)-(640,225),BORD,B:LINE(4,2)-(636,223),BORD,B:PAINT(1,1),BORD
290 J=I*225/640
300 DUMMY=RND(-ABS(RND*100))
310 X=RND*(630)+5:XX=X+RND*I:Y=RND*(219)+3:YY=Y+RND*J
320 IF X<6 OR XX>634 OR Y<4 OR YY>221 THEN 310
330 A=INT(RND*A(7)):B=INT(RND*A(7))
340 FOR C=0 TO 7:IF A(C)>A THEN A=C ELSE NEXT
350 FOR C=0 TO 7:IF A(C)>B THEN B=C ELSE NEXT
360 FOR C=X TO XX STEP 2:LINE(C,Y)-(C,YY),A:LINE(C+1,Y)-(C+1,YY),B:NEXT
370 IF XX-X>(I/2) OR YY-Y>(J/2) THEN I=I-DECAY
380 IF I<=MIN THEN COLOR 7,0:GOTO 410
390 X$=INKEY$:IF X$<>"S" AND X$<>"s" THEN 290
400 X$=INKEY$:IF X$=""THEN 400 ELSE 290
410 X$=INPUT$(1):IF X$="" THEN 410
420 IF X$="C" OR X$="c" THEN CLS:FLG=1:GOTO 10
430 IF X$="Q" OR X$="q" THEN CLS:LOCATE ,,1:END
440 GOTO 410
```

Listing 4. This program will produce a random series of colored ellipses and circles. (Long lines were broken here for convenience in printing.)

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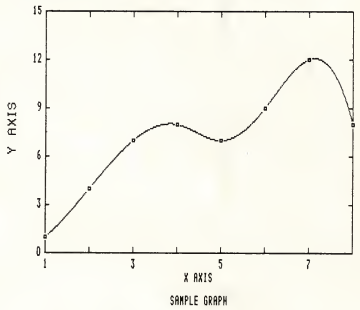

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Authors:

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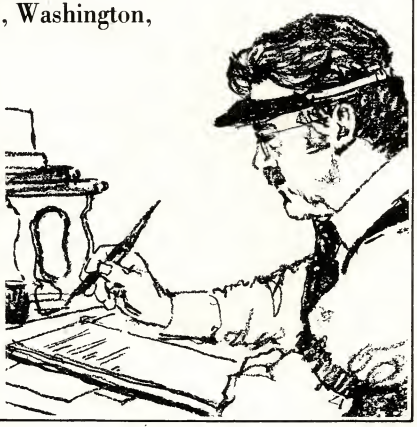


good-looking setup. (An enlarged print might look nice on a wall!)

If for some reason you abort a program with a CTRL-C, you may find that you've lost the cursor and that the background color is still on the screen. If so, enter:

```
COLOR 7,0:LOCATE,,1:CLS
```

and hit <RETURN> to make things manageable again. This will set white as the foreground (cursor) color, black as the background. Without any values specified for its first two arguments (line and row numbers), LOCATE will simply leave the cursor wherever it was; its third argument turns the cursor on. And the CLS clears the screen.

Other shapes?

If you don't like rectangles, how about circles and ellipses in 36 colors? Try the program in Listing 4. It lacks many of the features of the program for rectangles, but you can flesh it out if you like. Or you might try to do some painting with both rectangles and circles on the same screen.

Once you get the hang of generating geometrical figures in different colors, you can do diamond shapes and others. There's plenty of room for experimentation—with or without the many additional color graphics capabilities of Z-BASIC.

Differently colored vertical lines blend into each other better than horizontal lines do.

A final note

By the way, the "artwork" program compiles nicely with the Z-BASIC compiler. That's the way I use it—it is, of course, much faster. The several "colors" programs also run much faster after compiling.

I did not explain the painting program in detail. It contains some fairly complex routines that would take quite a bit of space to do justice to.

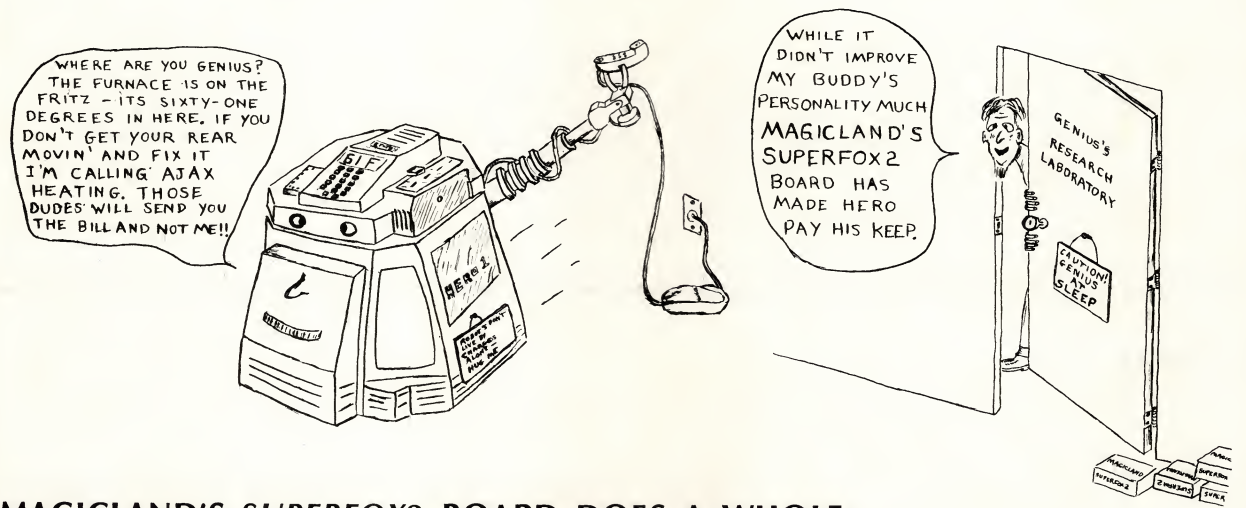
I'll be glad to answer questions, however, if you write and include a stamped, self-addressed envelope. If you've worked up a set of variables that produce particularly nice results, send them along to me.

It's possible to do serious art work with the techniques I've outlined. Some of the paintings I've constructed would make beautiful lithographs—at least as interesting as modern works I've seen in museums, and maybe just as meaningful.

Additional Information

Sidney Hack
1650 Kathwood Drive
Columbia, SC 29206

△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Coming up in *Sextant*:

- A comparison of Z100 word processors
- Answers to your questions about Z-BASIC
- How to install half-height drives in your '89
- A Tektronics 4010 emulator program for the Z100
- A program to let the '89 read "foreign" CP/M disks
- ***Reviews of:***
  - Mannesmann-Tally 160L printer
  - U.S. Robotics' S100 modem
  - The Z160 portable computer
  - SigmaSoft's Interactive Graphics Controller

Luminaries

Ray Albrektson lives and works in the Philippines. Though you may wonder what there is out there in the way of entertainment, he's found his fun—an H89 that gives rise to afternoon electronics projects.

Donald Carter is twice retired, having spent 25 years in the Royal Canadian Air Force and 25 more doing yacht work in Florida. Maybe in the year 2010 he'll give us a progress report on 25 years with Benchmark.

Thomas R. Fox is a man of many interests. His company, Magicland, is involved in electronics, farming, and religious book sales. The electronics division sells, among other things, a board that lets HERO read the temperature. Its firmware was programmed with the Intelliburner.

Sidney Hack is a retired U.S. Army colonel who likes to spend some of his free time improving Z-BASIC. In our November-December 1984 issue, he showed how he makes it friendlier. Here he's making it more colorful. Next—more musical?

William S. Hall is editor of *Mathematical Reviews*, and a professor at the University of Michigan. His company, MLM Associates (formerly called Moonlighting Mathematicians), sells a Morse code transceiver for the '89. So he's had plenty of experience "talking to" Zenith terminals.

Marilyn Harper is a senior programmer/analyst in Houston. She's received degrees in Chemistry, Anthropology, and Biology; she's also written for several computer magazines. She hasn't reported whether she's made any scientific discoveries while doodling.

Richard H. Hirsch is a research chemist with Monsanto Company in St. Louis, Missouri. His interests include electronics, orchids, and Alfa Romeos. And if his Alfa has a clock, why not his Z100?

Daniel N. Jerome works for Honeywell in Minnesota. As CP/M librarian for the St. Paul–Minneapolis HUG, he gives his H89A with six disk drives plenty of use. And in a situation like that, drivers and spoolers can come in especially handy.

Wayne Rash, Jr., is a Z100 user and prolific writer residing in Burke, Virginia. (You may have noticed the *Sextant* and *Byte* subdirectories on page 65.) In case you're wondering: yes, he has a full-time job also. We think he may really be two people.

Mitchell S. Ross is a captain in the U.S. Army and test director for new electronic systems installed in Europe. With this background, he should be the right person to walk *Sextant* readers through the installation of ZCPR.

Kenneth R. Van Wyk is finishing up his studies in Mechanical Engineering at Lehigh University. He's answered the question of how many mechanical engineers it takes to turn off the key click.

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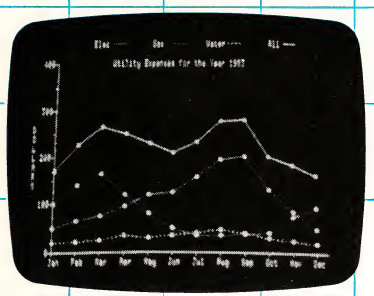

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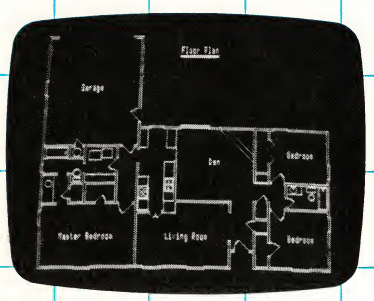

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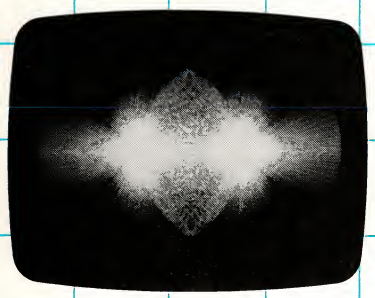

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Scale	x,y
Erase	x,y x,y
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Print	page
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An Example in BASIC:

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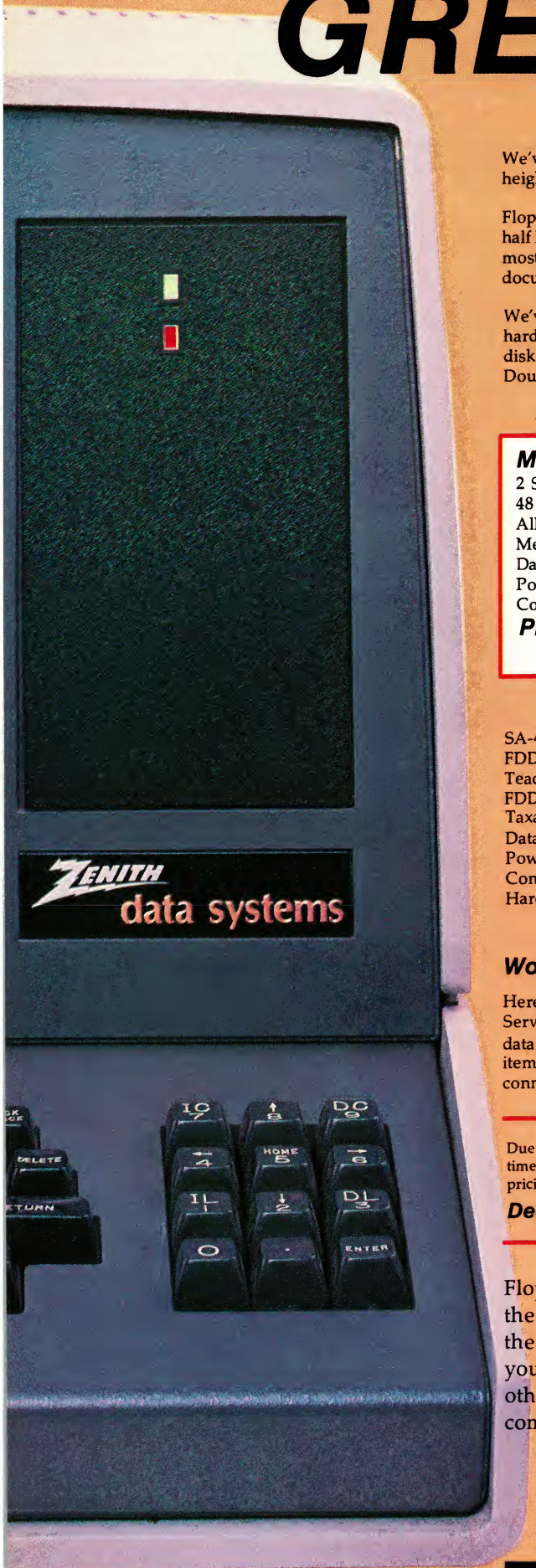

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Here's the solution. If you purchase a dual half height system for your Heath computer from Floppy Disk Services, just include an extra $65.00 plus shipping and receive a single 5¼ case with power supply and data cable ready to receive your SIEMENS internal drive! The case with data cable is normally an $85.00 item. And the cable that comes with your TWOET system includes the external chassis disk I/O connector.

Due to production deadlines, this ad is 2 months old at time of printing. We encourage you to call for our latest pricing and catalog requests.

Dealer inquiries invited.

We accept cash, MasterCharge, Visa, personal checks (allow 10 days to clear the bank), wire transfers, money orders, purchase orders from government agencies, and approved businesses. Call for info.

Floppy Disk Services inc. has been supplying custom enclosures and disk drives to the hobby and professional market for 6 years now! We have specifically supported the Heath/Zenith community with a high degree of success. We care about you and your system integrity. That's why we have been a success in a time when many others are going out of business. We are proud to be a part of the Heath/Zenith community and will continue our support with new products and ideas.

Visit our booth when you're at HUGCON!
August 9–11 Chicago, Illinois

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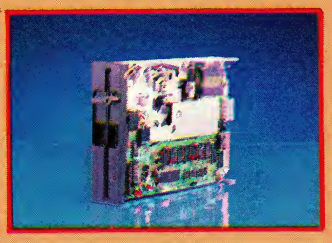
GREAT PRICES!

SA-455

Shugart SA-455 half height 5¼ is the standard for excellence in the disk drive community. Backed by a one year warranty and manufactured by the leader of drive technology, Shugart Corp. Ready to ship at $125.00 ea. Compatible with ALL of the Heath/Zenith computers.

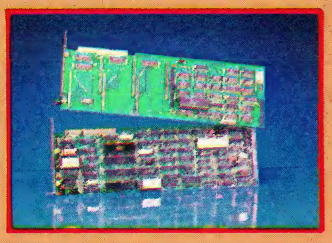


Taxan RGB Monitor

The Taxan (vision III) model 415 monitor is a high resolution RGB monitor designed to work with an IBM, Apple or compatible computer with an RGB output. 640 X 262 line resolution. $299.00 each.
IBM or Apple interface cable $15.00 each.

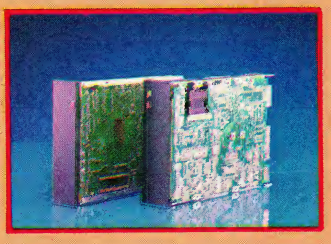
Maynard and DTC

We can supply PC compatible upgrade boards for your Z-150, Z160 system. Hard disk controllers, memory upgrade, and space saving Maynard modular boards. As an example, you can install a Maynard Modular 5 & 8 controller that will run 5¼, 8 inch and optional boards such as a clock/calendar module, game port, serial port or parallel port. Call for details on the slick way to upgrade and save a slot at the same time...



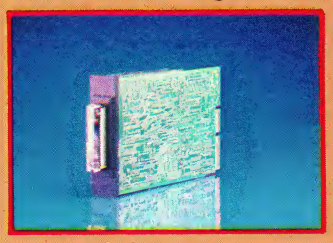
SA-712 & MicroScience

Half height 10 megabyte (20mb available soon) hard disk drives. The MicroScience has a plated media and is available with a full size bezel option. The Shugart has an on board low current option and is backed by a one year warranty. It also has a full size bezel option. both drives are available for the H/Z-89, H/Z-150, H/Z-160. $525.00 each.



Irwin-110

Data loss! It's a terrible thought. Minimize your chance of lost programs and data files with the new 110 tape drive from Floppy Disk Services inc. It works off the standard 5¼ controller which means you save money over standard tape backups that you must buy the controller for. The data cartridge holds 10mb of data and can retrieve in streaming or individual file form. Software included. Available in many configurations. For the IBM-PC, Z-150 or Z-160 only. (CP/M software being worked on). Tape unit $450.00 each, tape cartridge $20.50 each.

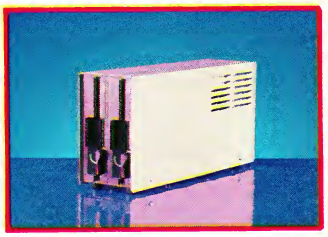


Connectors

Floppy Disk Services inc. can supply custom data and power cables for your needs. We use only the best! UL rated or listed components, and all power connectors are crimped by our AMP electric certified crimper. No hand crimping to vary the degree of accuracy. Only the best! Floppy Disk Services inc. can make 1 or 1000 connectors to your specs, fast! Call and ask for details...

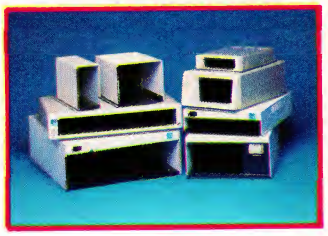
Special Sale!

Because of our enormous buying power in the industry we have made an excellent purchase of disk drives for your Heath/Zenith computer. Two Teac 55F 80 track double sided drives, in case with power supply and sheilded data cable, your price $363.00. Single drive system, $229.00 each.



Enclosures!

We manufacture and stock enclosures for every disk drive on this page and for almost any other drive you are likely to find. Available assembled and tested with state-of-the-art power supplies, these enclosures house a wide combination of half- and full-height drives to complement most available computers.



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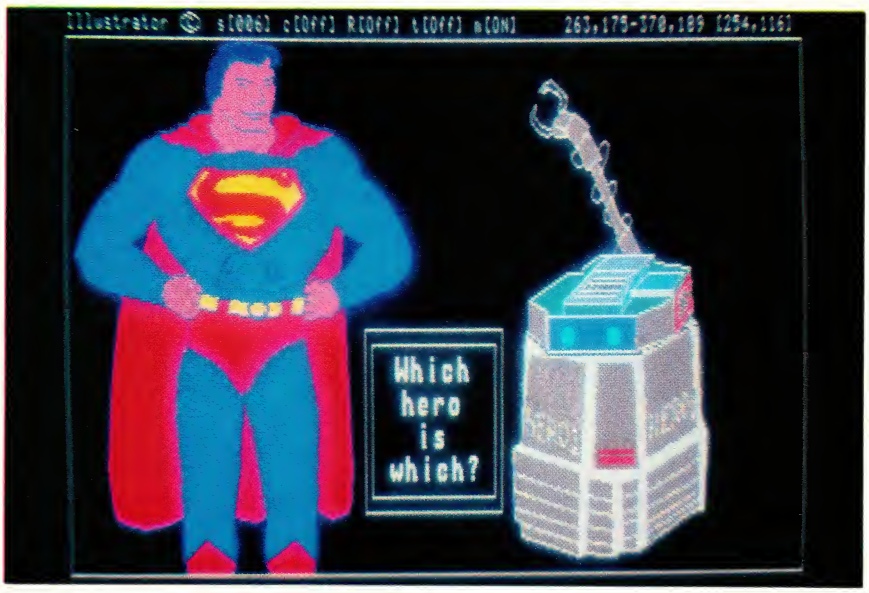
Supplier Notes

Illustrator Draws Super Heroes and Other Graphics



WIzard Software House has released version 2 of the Illustrator graphics design package for the H/Z110-120. Illustrator creates text, maps, graphs, and figures such as the one shown here.

Illustrator's features include commands for creating various shapes, including Circle, Ellipse, Diamond, Triangle, and Box. Other features include: Rubber Band Mode and Turtle Mode; irregular area fill; multispeed cursor movement; area copying, mirroring, and flipping; full or partial screen saving to disk; and restoring from disk with AND, OR, XOR, or SET.

Version 2 is reported to run faster than the original version, and includes several new functions. It allows the use of different font sizes and styles in a design without requiring the user to exit the program. It permits the creation of 26 user-defined macros, each of which stores up to 200 keystrokes. Macros may be saved to and loaded from disk, and permit the user to store and re-use routines which may be needed more than once. Full interlace operation permits the use of screen sizes of 640 x 400 pixels, 640 x 480, and 640 x 512, in addition to the standard 640 x 225 noninterlaced screen. Illustrator permits the use of a wide range of user-defined colors. Its batch mode for unattended operation is useful for demos and repetitive tasks.

MKFONT, a font generator/editor, is available for use with Illustrator. It will create OCR, script, H19, IBM, bold, block, and small (132 characters x 60 lines) fonts, among others. MKFONT costs $29.95.

Version 2 of Illustrator runs under MS-DOS 2.0+ or Z-DOS version 1.25+. It requires an H/Z100-110-120 with color RAM. The price is $89.95 plus 2% shipping and handling. Customers who purchased version 1 of Illustrator may have their software updated to version 2 and receive additional documentation by returning the original distribution disk to WIzard Software House with $25 plus 2% shipping and handling.

Illustrator is available from WIzard Software House, 79 Marshall St., Providence, RI 02909, or at Heath/Zenith Computers and Electronics Centers.

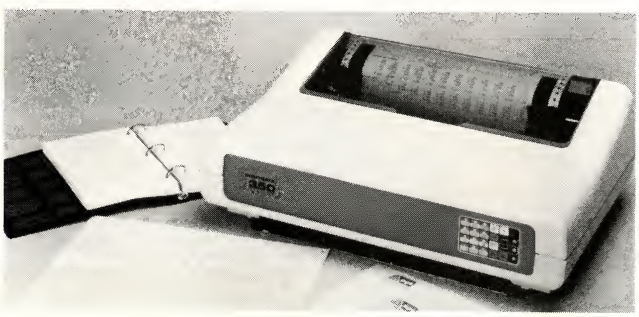
Printer Has High-Speed and Letter-Quality Modes

Micro Peripherals, Inc. offers PrintMate 350, a dot-matrix printer designed to produce letter-quality printing at high speeds for a low cost.

PrintMate 350 provides draft, correspondence, near-letter-quality, and letter-quality print modes at speeds up to 300 characters per second. In letter-quality mode, the printer generates characters with dot elements that overlap within a 23 x 18 dot matrix.

PrintMate 350 features a SoftSwitch 18-key keypad. Through various command sequences, the user can adjust character densities, margins, form length, print quality, communication speed, IBM compatibility, character wrap, buffer reset, vertical tab set/clear, characters per inch, lines per inch, auto line feed, perforation skip, and more. A reference card is provided which gives the sequences necessary for all commands.

Printmate 350 comes standard with 16K of buffer memory, which can be expanded to 80K. The printer can store a document in its buffer and repeat the document up to 99 times while freeing the computer for other jobs.

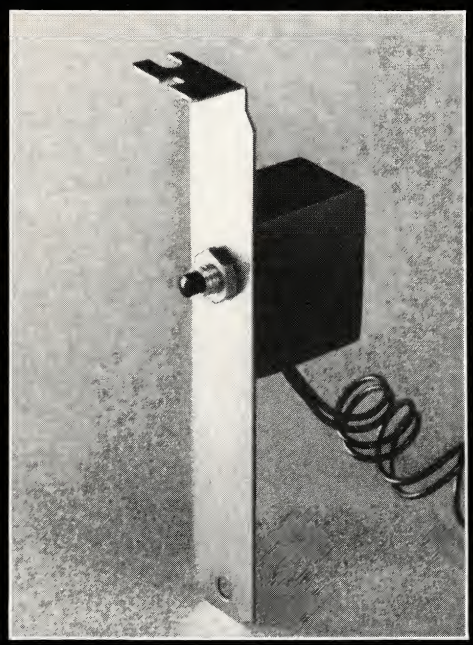


PrintMate 350 costs $1,495. For more information, contact Micro Peripherals, Inc., 4426 South Century Dr., Salt Lake City, UT 84123, 801/263-3081.

Install a Clock-Calendar in Your '150

Hyper-Clock is a single-function clock/calendar board for the IBM PC and compatible computers, including the Z150-160. The clock is powered by a replaceable lithium cell.

Hyper-Clock comes with all necessary software. During the boot-up process, the software reads the date and time



YOUR Z-150 PC'S POWER SWITCH IS **NOT** A RESET BUTTON

RESET-Z IS!

No more need to power down your Z-150 when it hangs up!

INTRODUCTORY PRICE **$29.95**

- **Electronic system reset that safely simulates power-on reset condition.**
- **Eliminates wear and tear on your power supply, boards and drives.**
- **Prevents possible hard disk damage.**
- **5 minute installation requires only a screwdriver; EASY step by step instructions require no soldering or drilling.**
- **Installs in rear panel and requires no slot.**
- **Introductory price- $29.95 including shipping & handling.**

For use on Z/H-150 and 160 computers only
Dealer inquiries invited.
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Double the Speed of your H/Z89-90
Cut computing time by as much as 50%

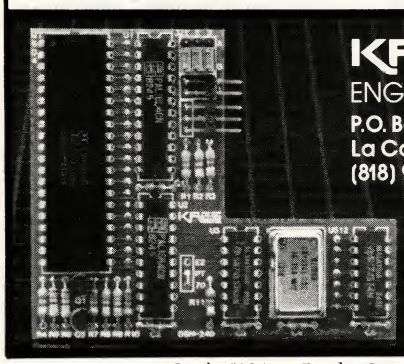
Fast Operation
With the Dual Speed Module, software that used to be slow and inefficient now zips right along. Run programs like SuperCalc (in "auto mode") and Spellstar without long waits.

Easy
Simply replace your existing microprocessor IC with the Dual Speed Module and stop wasting time. Installation requires no trace cutting or soldering.

Fully Supported
Software support for CP/M, HDOS, AND CP/M+ Works with Magnolia Microsystems*, CDR, and many other disk systems.

Dual Speed Module DSM-240 $99.97**
+ $3.50 shipping and handling (includes CP/M *or* HDOS; add $10.00 for both).

*Requires Software Patch PMM-100 $49.95 and Monitor ROM KMR-100 $59.95
**All prices subject to change without notice.
CP/M is a registered trademark of Digital Research.



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For Zenith 150 & 160

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Built in functions let you eliminate such time consuming programming chores as sorting, matrix inversions, and string searching.

STSC's APL★PLUS PC System does all this and more. You can integrate to non-APL programs and data files. And APL programs developed on your PC will run on other desktops and minis and mainframes.

Our complete package price is $595. Major credit cards are accepted. Call us today and we'll send you our free Convincer Kit. Contact your local dealer or call **800-592-0050** (in Maryland, call **301-984-5123**).

The APL★System operates under MS DOS with 192K of RAM memory. A custom APL character generator ROM is included.

APL★PLUS is a registered trademark of STSC, Inc.

Problem-solving at the speed of thought.

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Circle #136 on Reader Service Card

Workman & Associates

112 Marion Avenue
Pasadena, CA 91106
(818) 796-4401

5-1/4 inch DSDD or 10 sector Heath blank disks $25.00 per box.

WRITE

The Writer's Really Incredible Text Editor lives up to its name! It's designed for creative and report writing and carefully protects your text from loss. Included are many features missing from WordStar, such as alphabetized directory listings, fast scrolling, and trial printing to the screen. All Editing commands are single-letter and can be changed quickly. WRITE is $239.

Software Essentials

This package contains a word processor, printer program, database programs, and more for only $124. For all MS DOS and IBM PC compatibles.

Software Anthology Series

Workman and Associates has a series of seven disks of thoroughly tested and documented programs to help the CP/M user do what he wants without having to write his own programs. The disks are only $32.50 each.

All US orders are postpaid. We ship from stock on many formats, including: 8", Apple, Osborne, KayPro, Otrona, Epson, Morrow, Lobo, Zenith, Xerox. Please request our new catalog. We welcome COD orders.

Circle #229 on Reader Service Card

Now With Windowing!
$49.95 Basic Compiler

MTBASIC

Features:

Multitasking	Windowing
Handles interrupts	Interactive
Fast native code	Compiles quickly
Floating point	No runtime fee

MTBASIC is a true native code compiler. It runs *Byte's* Sept. '81 sieve in 26 seconds; interpreters take over 1400 seconds! Because MTBASIC is multitasking, it can run up to 10 Basic routines at the same time, while displaying ten separate windows. Pop-up/down menus are a snap to implement.

The MTBASIC package includes all the necessary software to run in interpreter or compiler mode, an installation program (so *any* system can use windowing), three demonstration programs and a comprehensive manual.

AVAILABLE for CP/M (Z-80), MS-DOS, and PC-DOS systems.

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SOFTWARE: CP/M, MS-DOS, ZDOS. SPECIFY HARD/SOFT SECTOR 5¼".

COMPLETE SYSTEM WITH FULL DOCUMENTATION
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Circle #243 on Reader Service Card

from the Hyper-Clock and inserts them into the operating system's date and time functions. Pop-Alarm software from Bellsoft and a selection of 29 public domain programs are included with Hyper-Clock.

The clock package costs $49.95. To order, contact Hyper-Micro, Inc., 2308 4th Ave., Seattle, WA 98121. Money orders or certified checks are preferred; personal checks require two weeks to clear. For Visa and MasterCard orders call 800/228-3388. For technical information call 206/441-9814, Monday through Friday, 9:30 to 5:30 Pacific Time.

Tektronix-Compatible Graphics for Z29 Terminal

A graphics terminal featuring Tektronix-compatible graphics-mode and DEC-compatible text-mode operation is available from Northwest Digital Systems.

The GP-29 features 128K bytes of memory which permits extensive off-screen scrolling and advanced graphics features. Dual memory plane operation lets the user create graphics with shades of grey, or overlay two separate images on the screen. Owners of the Zenith Z29 terminal may install the GP-29 retrofit board to gain the same capabilities.

In the graphics mode, the GP-29 offers both 1024 x 500 (high) resolution and 512 x 250 (low) resolution operation, and functions such as zoom, pan, area fill, area move, arc drawing, and area erase. The user may store images in off-screen memory. The GP-29 is compatible with the Tektronix 4014 graphics display terminal and can employ graphing software packages written for Tektronix terminals.

In the text mode, the GP-29 emulates the DEC VT200 and VT220 terminals. Four text display formats are standard: 80 x 24, 80 x 49, 132 x 24, and 132 x 49. With the off-screen memory feature, the user can store up to 75 pages of text and scroll them on screen.

Terminal setup on the GP-29 is menu-driven. The terminal's entire keyboard can be reprogrammed by the user for improved program control or software compatibility.

The GP-29 has a list price of $1,695. The GP-29 retrofit board for the Z29 terminal has a list price of $995.

For further information, contact Duncan Gilmour, Northwest Digital Systems, P.O. Box 15288, Seattle, WA 98115, 206/524-0014. △

Attention Z-100* Owners!

If you are using 8-bit software on your Z-100, there are at least 17 reasons why you should be using CP/M Plus instead of CP/M-85. Here is reason number 1:

Speed

CP/M Plus is much faster than CP/M-85. In actual benchmarks, dBASE II, for example, ran 400% faster under CP/M Plus than under CP/M-85 (10:57 vs. 46:42).

For more information on CP/M Plus (and the other 16 reasons) please contact:

Barry A. Watzman
560 Sunset Rd.
Benton Harbor, MI 49022
(616) 925–3136

*Z-100/110/120; not for Z-150/160 series.
CP/M Plus is a trademark of Digital Research.

Circle #206 on Reader Service Card

Meet the staff of Sextant *in Booth #45 at the 4th annual Heath/Zenith Users' Group International Conference (HUGCON).*

August 9–11, 1985
Hyatt Regency O'Hare
Chicago, Illinois

For more information about the conference, contact the Heath/Zenith Users' Group, Hilltop Road, St. Joseph, MI 49085, 616/982–3463.

See you there!

Scuttlebutt

Zenith's "other" laptop may be a reality. We reported here in the March-April issue that Zenith was working on a laptop with a Microsoft operating system in ROM. Last issue, we reported that the machine was out of the picture.

Well, **it's back in again**, according to *PC Week* (May 7 issue). The operating system is called Microsoft Works, and they called the machine the "ZD-150." Apparently the earlier version of Microsoft Works was not bug-free. *PC Week* quoted a Microsoft source as saying, "Look, once you burn in that software, it's not like you can mail out a bug fix to everyone." Retailing for $1,195, the ZD-150 is on display at Heath/Zenith Computers & Electronics Centers.

On the subject of products **some people told us not to expect**: D.E.L. Professional Systems gave a demonstration of their **Gemini board** in *Sextant*'s offices in April. They installed it in our Z110, and we provided them with several IBM-PC programs to run on it. It's a shame to see the Z100's display downgraded—but D.E.L.'s board **took the IBM programs in stride**.

According to their estimates, the board should be in production by the time you read this. And don't be surprised if you do see it in Heath stores after all.

The U.S. Navy has chosen **Seequa Computer Corp.** over ZDS, among others, to provide up to 36,000 portable computers under a three-year contract. Several groups affected by the decision have criticized the choice, maintaining that the Navy will end up paying far more than it should for **technologically obsolete products**. Seequa structured the bid with **declining prices** over the three-year term. The prices will start as high as $1,435, and end up as low as $450 in the last year. The other competitors for the contract, including Zenith, offered bids between $900 and $1,000 throughout the life of the contract.

The problem comes up when you account for obsolescence; the Navy probably won't be buying the machine for the full three years. One observer commented to *PC Week*, "**They're used to buying things like ships** that last for 50 years; they just don't seem to realize that computers become obsolete and they're going to spend $500 more per unit than they have to."

The latest edition of Rand McNally's *Places Rated Almanac* lists **Benton Harbor, Michigan**, (home of Heathkit) in **324th place**, out of 329.

Well, Zenith advertises now. And they've found a clever way to **use the Z100's accomplishments to sell the Z150**. An ad in *Business Week* reads, "Today, *more than 275* major centers of higher education have chosen Zenith. And the list continues to grow. Why? Because the Z100 PCs are IBM PC-compatible...." (The list may grow because of compatibility, but it got that high because of excellence.)

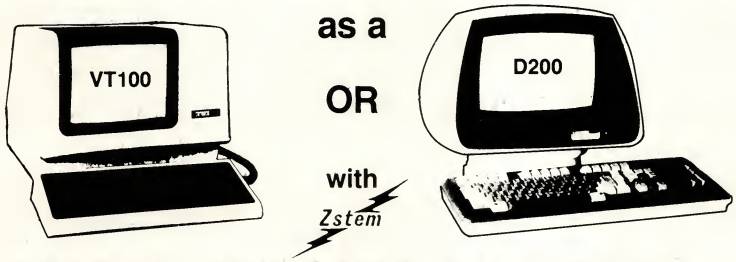
And, in an ad that boasts the Air Force's choice of the Z120: "Now, **from the same tradition as the Zenith Z120**, come the 'total performance' business computers: the Zenith Z100 PCs." Funny, we thought they were from **a *different* tradition**.

Sign up early and often for the **International Heath/Zenith Users' Group Conference**, August 9–11 at the Hyatt Regency O'Hare in Chicago. A $25 entrance fee gives you the run of the conference. A $10 visitor's ticket is also available, which does not include food or eligibility for door prizes. Further information is available from HUG. (Hilltop Road, St. Joseph, MI 49085, 616/982-3463.)

Tom Jorgensen of Software Wizardry has hinted about a new product that would increase the attendance of HUGCON by about 500, if he were at liberty to discuss it.

Is Zenith sending neophyte sales people to trade conferences? Or is there something they haven't told us? A COMDEX attendee reports the response he got at Zenith's booth to an inquiry about upgraded Z100s: "**We don't make a Z100—only a Z200.**" (See pages 12–13 of this issue for information on the Z200.) A second salesperson gave the same response. When this user's wife asked at the same booth about graphics software, she was told, "I'm sorry. We're not interested in software here—only hardware."

Use your Z-100 or Z-150/160



SMART TERMINAL EMULATOR

Connect to PDP-11, DEC-10, VAX for on-line data input or editing. Use with ALL-IN-1 EDT, WORD-11, DEC CALC

Connect to your Data General Nova, Eclipse, or MV Series for on-line data input or editing.

Transfer files from your host for input to spreadsheet/word processing or local modification prior to transfer back to the host.

VT100 emulation on the Z-150 includes:
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• Complete VT100 line graphics • Smooth scrolling •
• International Font Support •
• ZSTEM-VT100 $148.95 U.S. •
• ZSTEMpc-VT100 $150.00 U.S.

All versions include:
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• ZSTEM-D200 $124.95 U.S. •
• ZSTEMpc-D200 $125.00 U.S. •

704 K Bytes on Z-100 PC
• Use 256K bit Chips on original memory board •
• ZPAL-2 Decoder •
$38.00 each

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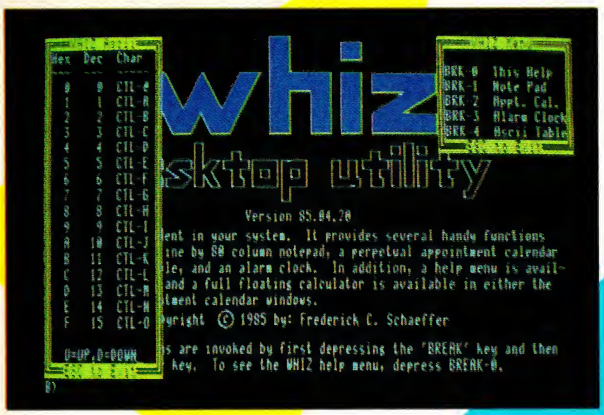
Breeding Shows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sktop utility
Version 85.04.20
ent in your system. It provides several handy functions
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le, and an alarm clock. In addition, a help menu is avail-
and a full floating calculator is available in either the
tment calendar windows.
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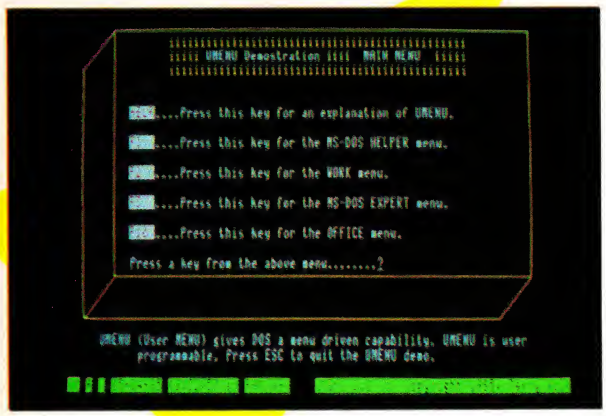
s are invoked by first depressing the 'BREAK' key and then
key. To see the WHIZ help menu, depress BREAK-0.

whiz


UMENU Demonstration MAIN MENU
....Press this key for an explanation of UMENU.
....Press this key for the MS-DOS HELPER menu.
....Press this key for the WORK menu.
....Press this key for the MS-DOS EXPERT menu.
....Press this key for the OFFICE menu.
Press a key from the above menu.....?
UMENU (User MENU) gives DOS a menu driven capability. UMENU is user programmable. Press ESC to quit the UMENU demo.

umenu

hugcon

?

The Software Wizardry name has been synonomous with quality software and hardware among discriminating Heath/Zenith users for years. Ultrarom · Zlynk/II · P-SST · Palette · RamPal · ESP · The Lightpen. A list of products distinguished not by quantity, but by quality. Select products, recognized as the best in their class. To this elite stable, Software Wizardry is pleased to add two new thoroughbreds: **WHIZ** and **UMENU**

WHIZ is a "demon" for your H/Z-100 which remains resident while other programs are loaded and run, and is available at the touch of a key, even while your application programs are running. WHIZ functions are accessed through pop-up windows, which can be moved around on the screen by the user.

Similar in concept to Sidekick, WHIZ is not a slavish imitation, but a considered improvement. Designed in a highly modular fashion, future updates will add additional functions.

Included in the first release are a **Scientific Calculator,** worth the price of the package in and of itself, providing a full floating point algebraic expression evaluator. Rather than a cute but inefficient image of a handheld calculator, WHIZ allows direct entry of complex algebraic/trigonometric functions for immediate evaluation, including square root, sine, cosine, tangent, arc sine, cosine and tangent, hyperbolic sine, cosine, and tangent, base 10 log, natural log, and natural antilog.

Also included are Context sensitive **Help;** an **Alarm Clock** which activates irregardless of application currently running; an **ASCII Table;** and a **Notepad,** providing an 80 character by 40 line space which lets you make notes to yourself, and also serves as a text editor, to read, write and edit small text files, and view files of any length. Finally, the **Appointment Calendar** provides a 10 line by 40 character record for each date until well into the 22nd CENTURY! Only active records are stored to minimize disk space usage. You can "step through" the date file by day, week, or month.

Memory Resident, WHIZ requires 70K to 110K (user specified) of available system memory. All functions work, even on a minimum memory allocation, just not all at the same time. WHIZ runs on a H/Z-100 with at least 192K RAM and MS-DOS 2.13 or higher.

UMENU is an advanced menu interface program for the H/Z-100 which allows the setup of a highly efficient interface to the operating system and application programs. It is especially useful for the set-up of systems to be used by the novice or non technical user, providing easy access and on-line help files. The experienced user will also value it for his or her own use because of its powerful DOS command line entry capabilities.

UMENU combines the best features of a menu based system WITH the best features of a direct command line entry system. Expecially in conjunction with the optional **Software Wizardry Lightpen,** access through menu items is lightning-quick. Additionally, all MS-DOS command lines can bedirectly entered at the UMENU'scommand line editor.

Powerful and efficient, UMENU provides programming-language style features for creating binary command files for building menus. Commands include color and line graphics for creating menu displays, "command completion" by the user, and command string entry by typing first letter only.

UMENU runs memory-resident under MS-DOS 2.xx, and optionally displays the current path name as-well-as showing the time. UMENU runs on H/Z-100s with Z-DOS and 128K RAM, but MS-DOS 2.xx and 192K RAM or greater are recommended.

No just another menu program. UMENU is a high-level tool for efficient use of your Zenith, written by people who know the H/Z-100 inside and out.

If you appreciate the Best of Breed for your system, choose the products appreciated by connoiseurs those from Software Wizardry!

Software Wizardry products are available at authorized dealers, and at most Heath/Zenith Computers and Electronics Centers.

Watch for a surprise major product announcement at HUGCON, when we continue our tradition.

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WHIZ is copyright © by Frederick Shaefer and Software Wizardry
UMENU is copyright © by Terry Wilk and Software Wizardry

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